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THE JOURNAL

OF

THE LINNEAN SOCIETY.

On the Source of the *Radix Galangæ minoris* of Pharmacologists.

By HENRY FLETCHER HANCE, Ph.D. &c.

[Read December 1, 1870.]

WHILST it is, I believe, fully established that the "Greater Galangal" is produced by *Alpinia Galanga*, L., the plant which yields the lesser kind has hitherto remained altogether doubtful, though some writers have hazarded the opinion that it is the rhizome of *A. chinensis*, Rosc. It is now more than twelve years since my attention was first drawn to the subject by my esteemed correspondent Mr. Daniel Hanbury, who begged me, if possible, to set the question at rest.

I have never lost sight of Mr. Hanbury's wishes; but although the drug forms a considerable article of export from Southern China *, my want of success will not seem surprising

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* Galangal is not used in British medical practice; and, even on the Continent, Endlicher speaks of it as "exoleti fere usus." The following statement of the export of this drug during the last three years is compiled from the official returns published by the Foreign Inspectorate of Maritime Customs, the quantities and value being, however, for greater convenience, reduced to British weight and currency.

Years.	From Canton.				From Shanghae.				Total.			
	Quantity.	Value.			Quantity.	Value.			Quantity.	Value.		
	lbs.	£	*s.*	*d.*	lbs.	£	*s.*	*d.*	lbs.	£	*s.*	*d.*
1867 ...	32,800	123	10	10	79,200	354	9	9	112,000	478	0	7
1868 ...	15,233	57	10	0	162,308	1149	3	5	177,641	1206	13	5
1869 ...	None	....			370,800	3046	16	9	370,800	3046	16	9

when it is borne in mind that many vegetable products shipped from Canton come from distant parts of the empire, and pass through a number of hands before they reach those of the native merchants, and that these latter are quite incapable of comprehending the interest attaching to the solution of a doubtful scientific point, or of troubling themselves about what seem to them matters of aimless and puerile curiosity. Those who have tried know well how difficult it is to get reliable information from the natives, who will frequently invent answers, rather than seem ignorant, and are especially prone to reply in the affirmative to direct or leading questions, as if they supposed the object of an inquirer was rather to obtain the confirmation of his own views than to elicit the truth.

In November 1867 I had the opportunity of making a visit—at the invitation of, and in company with, the Commissioner of Maritime Customs at Canton—to the Island of Haenan. During this excursion, and while at anchor off Pak-shá, a fishing-village on the south coast of Kwangtung, about seventeen miles from, and rather to the east of Hoi-haŭ, on the north coast of Haenan, we landed, and some of the party went about six miles inland to a ruinous walled city named Hoi-on; but, being slightly indisposed, I preferred botanizing over the low hills near the coast. On their return, Mr. Sampson, who was one of the party, informed me that they had seen a large quantity of what he took for ginger (but which he described as bearing the inflorescence on the leafy stems) under cultivation; and another gentleman produced—asking if I knew what it was—some pieces of rhizome, of which quantities had been passed, exposed to the sun in shallow bamboo baskets to dry. This I immediately identified as Galangal; and as some inquiries made of a linguist who had accompanied them left no doubt that the rhizome belonged to the plant seen growing, I had the mortification of knowing that the true Galangal plant had been met with, and no specimens obtained, whilst our arrangements did not admit of further delay.

Fortunately, however, at the close of the year, another expe-

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From this table it would appear that the demand for Galangal is increasing; but I cannot explain why the export of a product of the extreme south of China should be transferred from Canton (the nearest port) to Shanghae, situated 8° further north.

dition to Haenan was planned; and on this occasion Mr. E. C. Taintor, an American gentleman in the service of the Imperial Customs, to whom I was indebted for the specimens of the Oaks on which the North Chinese wild silkworm is fed, respecting which I have already communicated a paper to the Society, accompanied it. Mr. Sampson took great pains to indicate to Mr. Taintor the locality where the plant had been seen; and I am happy to say that Mr. Taintor's researches were crowned with complete success, he having brought back fine living plants with the rhizomes attached, an examination of which, and comparison with authentic specimens of the drug from Mr. Hanbury and others, procured here, leave no doubt whatever of the species being the true officinal one.

The following account from Mr. Taintor's notes will explain how he obtained the plant. "The locality is about one mile north of the small village of Tung-sai, situated upon the Bay of Pak-shá, at the southern extremity of the peninsula of Lui-chau-fú, or Lei-chau-fú, and directly opposite Hoi-haú, the port of Kiung-chau-fú in Haenan. The plant was growing at an elevation of about 100 feet above the level of the sea, in a very dry hard red soil, evidently composed of disintegrated volcanic rock. The plant grew in masses, which had been originally planted and cultivated, but were now apparently neglected and running to waste. The roots were in dense masses of sometimes more than 1 foot diameter, and with as many as twenty-five or thirty stalks springing from each. Rarely more than one or two of these stalks, however, bore flowers at the date of collection, January 5th. My plan, to insure that I was getting the real plant, was to write the two characters *Liang-kiang*, 良 薑 (*mild* or *gentle ginger*, the Chinese name), and tell an intelligent-looking villager that I wanted to see the flower. He led me, without the least hesitation, directly to the spot where I obtained the plants."

I must add that Mr. Swinhoe has since found the plant growing wild in dense jungle on the south coast of Haenan, one of his specimens being now before me, and that he has informed Mr. Hanbury, as I quite recently learnt from that gentleman, that there is good reason for believing that its fruit is the *Bitter-seeded Cardamom*, figured in Mr. Hanbury's valuable paper * "On some rare kinds of Cardamom."

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* Pharm. Journ. xiv. 418, fig. 8.

In endeavouring to determine the specimens collected by Mr. Taintor, I found in my herbarium, for the purpose of comparison, only the Hongkong species of *Alpinia*, and a few Moluccan ones, received from M. Teijsmann, of the Buitenzorg Garden; whilst, as regards books, I was restricted to Roxburgh's 'Flora Indica,' the writings of Wight and Miquel, and the very useful 'Prodromus Monographiæ Scitaminearum' of Prof. Horaninow, published at St. Petersburg in 1862. With these somewhat slender *adminicula*, I was soon satisfied that the Galangal was either referable or else very closely allied to *A. calcarata*, Rosc. (which Roxburgh states to have been introduced from China into the Calcutta garden); and though I found some discrepancies between the Kwangtung specimens and the description of *A. calcarata* drawn up from the living plant by Roxburgh *, whose accuracy is so well known, yet these were apparently so few and unimportant that my chief ground of hesitation as to their identity was the extreme improbability that the rhizome of a plant widely cultivated within the tropics, and growing and flowering luxuriantly in the Calcutta and also, according to Thwaites †, in the Peradenia garden, should have remained for so long a period unrecognized, if really the same as the Lesser Galangal of commerce.

It being evident that this question, of so much interest in itself, could not be solved with the means at hand, whilst an approximate judgment would be valueless, I determined to let the matter lie over until I had access to more complete materials.

Since then I have received, through the kindness of Mr. Hanbury, a sketch, with a single flower coloured, of the plate of *A. calcarata* given in Roscoe's 'Scitamineæ,' and a full-coloured copy of that in the second volume of the 'Botanical Register;' whilst my ever liberal friend Dr. Thwaites has sent me living rhizomes of the same species, whence have been reared fine healthy plants, though they have not as yet flowered, and, besides, copious specimens both of the flowering plant for the herbarium, and of the dried mature rhizomes. Mr. Taintor's Galangal plants have also again blossomed under culture, but set no fruit ‡; so that *fresh* flowering specimens of *A. calcarata*, and fruit of both species being alone wanting, I may claim to have had at my disposal as good materials for comparison as ordinarily fall to the lot of a descriptive botanist. I have, to the best of my ability, made a careful and exact comparative examination of living flowerless plants of each kind (including the rhizome), and of the mature rhizome of each; whilst I have compared the fresh and also the dried flowering plant of the Galangal with separate dried flowers, as well as herbarium specimens of the entire inflorescence, of *A. calcarata*. The result is, that I am now entirely satisfied that the plant which furnishes the Lesser Galangal root is, though very closely allied to *Alpinia calcarata*, Roscoe, a perfectly distinct and well-defined species, the two differing in several particulars of structure, as well as in sensible qualities, as the following brief comparative notes will show:—

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* Flora Indica, ed. Carey, vol. i. p. 69.

† Enum. Pl. Zeyl. p. 320.

‡ Zingiberaceous plants when under cultivation, even in localities where they are native, are far less disposed to fruit than the same species in a wild state, the flowers usually dropping off as soon as they fade.

Alpinia calcarata.	*Galangal.*
Dried mature rhizomes chestnut-brown*, conspicuously furrowed longitudinally; when cut across, with a stronger odour than Galangal, the cut surface remaining of a fuscous hue; of a bitter aromatic taste, much like cardamoms, with a distinct flavour of rhubarb superadded, but destitute of heat. Sheaths and bases of the young living stems or shoots more or less tinged with pink; tasting somewhat like rhubarb, but without any hot flavour. Leaves of a full deep green; aromatic, but not hot in taste. Ligulæ 3–6 lines long, rounded or	Dried mature rhizomes externally rufous-brown, only very finely striated longitudinally; when cut across, surface becoming rufous; aromatic and very warm in taste, as if made up of ginger and pepper, with a recognizable camphoraceous flavour, leaving a powerful sensation of heat in the mouth when chewed†. Bases of young shoots white; tasting very warm. Leaves of a rather lighter green; hot in taste. Ligulæ 9–15 lines long, acutish. Racemes quite simple. Flowers without a bractlet. Labellum without the slightest trace of yellow, its veins very fine.

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* Described by Roxburgh as somewhat woolly and pale-coloured. Dr. Thwaites and myself find them perfectly smooth, both when young and at full growth. The young fresh rhizomes of both plants are quite white and succulent; but these can scarcely be alluded to: again, some dried rhizomes kindly supplied from the Calcutta garden are cinnamon-coloured; but these are of small diameter, and evidently immature. The full-grown ones from Ceylon are, as described, of a chestnut hue externally.

† Cæsalpinus characterizes the rhizome very accurately, though briefly, as "subrufa intus et extra, sapore Piperis, modice odorata" (De Plant. lib. iv. c. 62).

truncate, and frequently bifid at apex. Racemes compound*. Flowers with an oblong concave bractlet at their base†. Labellum "yellowish, minutely punctated with dull red, and with veins of a deep dull red colour" (Thw.)‡, its veins thickish.

The fruits of both species, when known, may afford other marks of distinction.

A description of the Lesser Galangal plant, for which I propose the name of *Alpinia officinarum*, drawn up very carefully from living specimens, may fitly bring these notes to a close.

ALPINIA OFFICINARUM, n. sp. Rhizomatibus longe repentibus atque intertextis cylindraceis 6–9 lineas circiter diametro rufo-brunneis glaberrimis squamis magnis pallidioribus fibrosis demum secedentibus annulosque irregulares sinuosos albidos relinquentibus copiose instructis, caulibus $2\frac{1}{2}$–$3\frac{1}{2}$-pedalibus, foliis bifariis longe vaginantibus coriaceis glaberrimis nitidis anguste lanceolatis basi angustatis sed non petiolatis exquisite attenuatis 9–14 poll. longis medio 10–12 lin. latis ligula magna (9–15 lin. longa) oblonga scariosa erecta basi decurrente vaginas marginante apice acutiuscula auctis, racemo terminali simplici erecto densifloro brevi (plerumque haud 4-pollicari) foliis superato, rachi tenuiter tomentella, bracteis § spathaceis involucrantibus binis exteriore viridi nunc folio abbreviato coronata interiore alba ambabus demum extus stramineo-arefactis nitidis intra margineque scariosis cucullatis flore pluries longioribus vel simul apicibus invicem convolutis basique solutis calyptratim secedentibus vel interiore paulo serius decidua, floribus ebracteolatis arcte subsessilibus 15 lin. longis, perigonio exteriore albo tubuloso tomentello apice breviter 2–3-lobo lobis scariosis rotundatis ciliatis, perigonii interioris albi tubo extus intusque tomentello lobis oblongis obtusis cucullatis 8–11 lin. longis 2–2½ lin. latis tertio paululum majore et latiore, labello albo medio striis vinoso-rubris juxta apicem in maculam distinctam flabellatim dilatatis percurso aliisque pallidioribus a lineis medianis interioribus marginem versus pinnatim radiantibus elegantissime picto sessili ovato integro apice acutiusculo vel bilobo crispulo-eroso 10 lin. longo 8–9 lin. lato basi corniculis binis rigidulo-carnosis subulatis subreflexis 1–1½-linealibus pilis capitatis consitis basique glanduloso-incrassatis conniventibus tubum occludentibus aucto, stamine labello dimidio breviore, ovario densissime albo-tomentoso, stylo apice sensim dilatato paulo ultra antheram producto, stigmate concavo margine ciliato, glandulis epigynis ¾-linealibus luteolis oblongis apice truncatis integris vel lobulatis.

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* So described by Roxburgh, and so I find them in all Dr. Thwaites's specimens; but represented as simple in Wight's plate (Ic. Pl. Ind. Or. vi. 2028), and also apparently by Roscoe, and in the 'Botanical Register.'

† Described by Roxburgh as "solitary, boat-shaped, white, 1-flowered," and shown in the Bot. Reg. plate, and also (so far as I can make out from the sketch) in that in Roscoe, but omitted in Wight's figure. Quite conspicuous in all Dr. Thwaites's specimens.

‡ Roxburgh describes the labellum as "deeply coloured with dark purple veins on a yellow ground." The Bot. Reg. plate represents it as crimson in the centre, with a broad yellow border, into which veins from the centre run, though not very conspicuously; whilst my copy of Roscoe's figure gives an oblong yellow centre dotted with crimson, and a broader margin striated with red and yellow, the latter colour slightly predominating. Considering the variation in colour of the flowers of *Canna*, and the differences of shade and marking in the labella of many cultivated epiphytes of the allied order *Orchidaceæ*, it is perhaps unsafe to attach any considerable weight to a character of this kind.

§ Though these exist equally in *A. calcarata*, it is curious that Roxburgh makes no allusion to them; he would have called the two an *involucre*. There is likewise no indication of them in the figures of the 'Botanical Register,' Roscoe, or Wight.

Habitat in interioribus insulæ Haenan; vix dubie etiam in silvis australiorum imperii Sinensis provinciarum, ubi commercii ergo large colitur (Exsicc. n. 16866).

British Vice-Consulate,
Whampoa, September 1870.

Supplementary Note on Chinese Silkworm-Oaks.
By Henry F. Hance, Ph.D., &c.

Καὶ σηρικοῦ νήματος ὑφαίνειν λόγους τῇ φιλίᾳ δίδωσιν ἡ Κλωθὼ τύχη.
Phile, In Verm. Seric. 1.

[Read December 1, 1870.]

In a paper read before the Linnean Society in May 1868 *, I showed that the tree on which feeds a larva spinning cocoons from which large quantities of silk are manufactured in the north of China is *Quercus mongolica*, Fisch.; and I gave reasons for the opinion that *Q. dentata*, Thunb., is also used to feed the same worm. When writing this paper, I had accidentally overlooked a valuable article by Dr. D. B. M'Cartee "On some Wild Silkworms of China," published in the 'Journal of the North

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* Journ. Linn. Soc., Bot. x. 482.

China Branch of the Royal Asiatic Society' *, from which the following passage is an extract:—"During my late sojourn at the Port of Chefoo, I learned from conversations with Chinese there, that three species of silk are manufactured in Shantung from the cocoons of wild silkworms; and the account given by them of the worms, &c., corresponded with the accounts given by the Jesuit Missionaries of similar operations in the province of Szchuen. The cocoons from which one of the kinds of silk is derived are called *Ta-kien* (*large cocoons*), or *Tso-kien* (*oak cocoons*). A species of oak was pointed out to me at Chefoo as the oak upon which the silkworm was reared, and is called by the natives *Tsoshu*, or sometimes *Po-lo-shu* †; but my informant was unable to give me the Chinese characters for the latter designation. The tree corresponded with the description given by M. d'Incarville, *Quercus orientalis Castaneæ folio, glande recondita in capsula crassa et squamosa* ‡. It is said that only young trees, not more than three or four years old, can be used."

The only oaks in Northern China agreeing at all with Tournefort's phrase, quoted by D'Incarville, are *Q. serrata*, Thunb., and *Q. chinensis*, Bge.; and my friend Mr. Mayers, now H.M. Acting Consul at Chefoo, who has been so kind as to make inquiries for me on the spot, says he can only find that one species is met with in that neighbourhood; and the specimens of this he has communicated belong to the first-named tree.

I have lately had an opportunity of seeing a Chinese work, entitled "Chih Wuh Ming Shih T'u K'ao," or 'Nomenclature and Description of Plants, illustrated with Plates,' the figures to which are very superior to those in the majority of Chinese books, and, though scarcely more than outline sketches, in some instances very characteristic. The fifth chapter of this work is devoted to a description of the *Ts'ing-kang* tree, for the following translation of which I am indebted to Mr. Mayers. I would remark that all Chinese notices of this kind contain, mixed with trustworthy statements, inaccuracies and puerilities, but in this respect are not worse than the Natural History of Pliny *, and immeasurably superior to J. B. Porta's 'Phytognomonica.' Chinese scientific literature is, and has been for ages, in that stage which the late Dr. Whewell characterized as the "commentatorial."

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* New Ser. iii. 75 (1866). Dr. M'Cartee identifies the moth as *Saturnia Mylitta*.

† Regarding this name, Mr. Mayer writes as follows in a letter to me, accompanying specimens of *Q. serrata*, Thunb. "The Chinese call it *Po-lo*, the same as at Newchwang; and, after some hesitation, characters have been given me for the sound which are apparently mere phonetic devices to represent a foreign or at least unwritten name. I should not wonder if the word *Po-lo* were Corean or Manchu, as the Chinese admit that it is not the correct name for the oak, which should be called *Siang*."

‡ Père d'Incarville quotes this as the designation given by "nos botanistes," referring, in fact, to Tournefort, and supposing that the Chinese oak is identical with some Asia-Minor species, most likely *Q. vallonea*, Kty. The fruit of this is exceedingly like those of *Q. chinensis* and *Q. serrata*, to which last Miquel reduces the Georgian *Q. castaneifolia*, C. A. M., which both C. Koch and Grisebach consider identical with *Q. vallonea*.

"The work called 'Kiu Hwang Pên Ts'ao' (or 'Description of Plants Available for use as Food,' published during the Ming dynasty) did not specify the locality where the *Ts'ing-kang* tree grows; but at present it is found everywhere. The larger trees, producing acorns, are called *Siang-li* (the generic names for the oak); whilst those that are smaller, and do not produce acorns, are called *Ts'ing-kang*. In its stem and foliage the *Ts'ing-kang* is altogether similar to the *Siang-li*; but the colour of its leaves is a lighter green, and its flowers less abundant. Their flavour is also bitter, but their properties are mild and devoid of noxious effect. The young leaves are gathered, and after being dried, are steeped in water until they become of a yellow colour. The water is then changed; and after being strained they are eaten with salt and oil" †.

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* I may here note, as bearing on the subject of this paper, that Pliny has a curious passage about a moth in the Island of Cos, the worm of which feeds, amongst other plants, on oak-leaves, and from whose cocoons silk was woven. Though fabulous and inaccurate in many particulars, as his statements so frequently are, owing to their being compiled without any critical spirit from an immense variety of sources, the allusions to the domestic rearing of this worm, to the softening of the cocoons in water, and their subsequent reeling, and to the lightness of the tissue as adapting it for summer wear, all clearly point to a wild silkworm. "Fieri autem primo papiliones parvos, nudosque: mox frigorum impatientia villis inhorrescere [a very Lamarckian idea!], et adversum hiemem tunicas sibi instaurare densas, pedum asperitate radentes foliorum lanuginem vellere: hanc ab his cogi unguium carminatione, mox trahi inter ramos tenuari ceu pectine. Postea apprehensam corpori involvi nido volubili. Tum ab homine tolli, fictilibusque vasis tepore et furfurum esca nutriri: atque ita subnasci sui generis plumas, quibus vestitos ad alia pensa dimitti. Quæ vero cœpta sint lanificia, humore lentescere mox in fila tenuari junceo fuso. Nec puduit has vestes usurpare etiam viros, levitatem propter æstivam" (Hist. Nat. xi. 23).

† Although oak-leaves are still used in Italy as fodder for cattle, as was

"*Additional Note.*—The *Ts'ing-kang* tree grows on hills interspersed with the *Tsiang-li* oak trees, being, in fact, of the same kind, but devoid of flowers and fruit. A green ball is frequently found developed at the extremity of its twigs, consisting of hairs as fine as the silky fibres of the *Tsung* tree (qu. a palm ?), but somewhat tougher. The native silk products of Kweichow province are woven from the silkworm cocoons of this tree; but they are of mediocre value, on the same principle that mulberry trees producing fruit, and *Siang* trees producing chestnuts, are all adapted to the growth of silkworm."

The plate annexed to the above description, a copy of which is here given, represents an oak with leaves like those of a shallow-lobed form of *Q robur*, and with three fruits (unless they are intended for the "oak-apple" mentioned in the text), one distinctly stalked, the dense squamæ of the cupule entirely concealing the acorn, and looking like those of *Q. dentata*, Thunb., though closely appressed, instead of being more or less reflexed.

Baron Léon d'Hervey-Saint-Denys, in his 'Recherches sur l'Agriculture et l'Horticulture des Chinois' *, published in 1850, and alluded to in Dr. M'Cartee's article, has quoted from the 'Annales Forestières' a note, by the Père Julien Bertrand, on the management of the wild silkworms in the province of Qweichow, here referred to, one of the two oaks employed being, in all probability, that figured; and as the subject is of great interest, and the book, I believe, not very well known, I have thought it well to translate this missionary's observations in full.

"Thong-kin-foo, July 19, 1842.

"I think I told you, some years since, that we have here a wild silkworm which feeds on oak-leaves, and which seems to be an object of much interest to the French Government. I imagine you will be glad to have some account of this, and I only regret that my ignorance of natural history prevents

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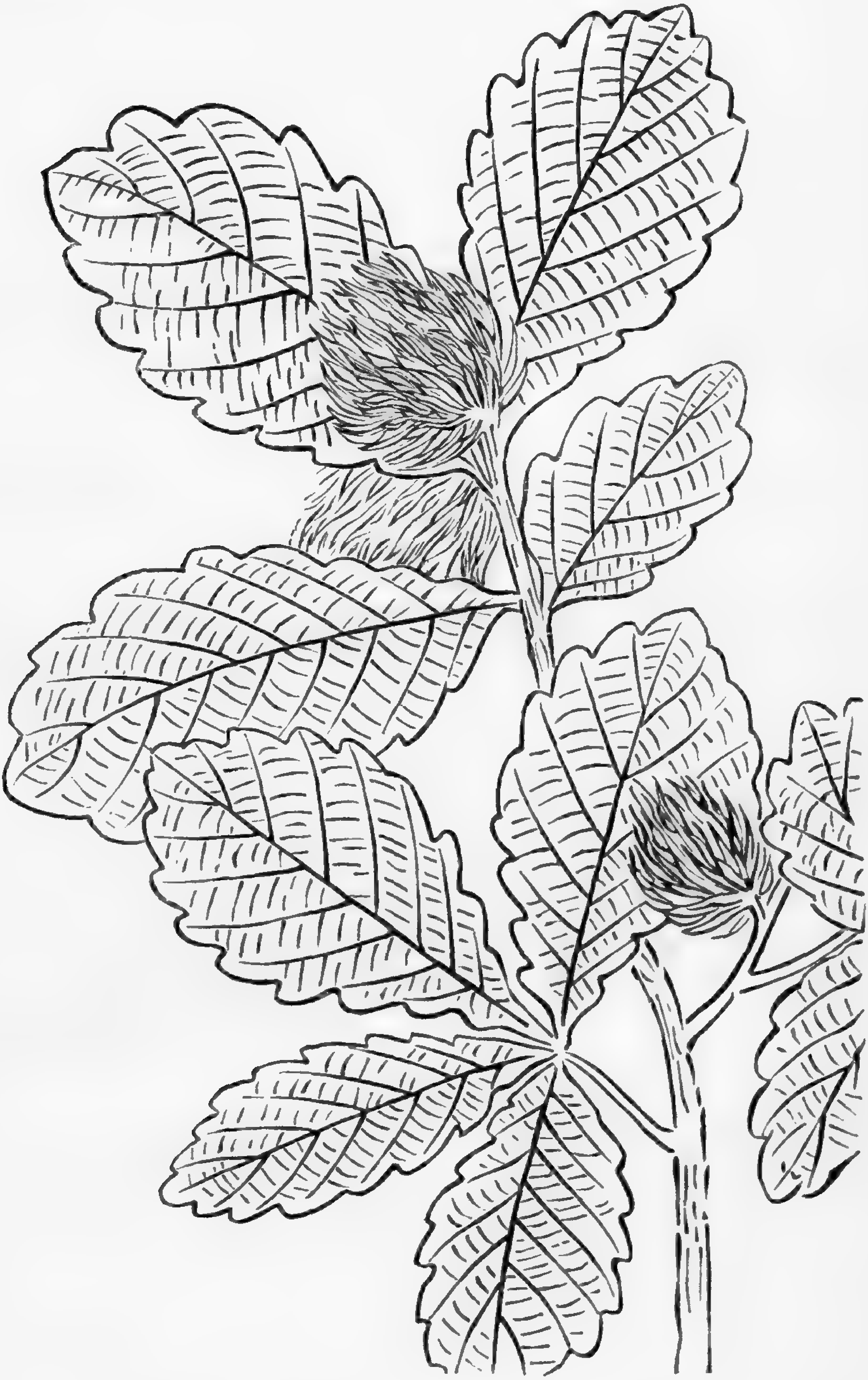
the case in the time of the Romans (Colum. De re Rust. vi. 3), they can scarcely be supposed to afford, even under the hands of a Celestial *cordon-bleu*, a specially luxurious or appetizing salad. The *Flora cibaria* of the Chinese, however, is so alarmingly comprehensive that it is more difficult to say what *is not* than what *is* eaten.

* Page 162.

my treating a subject of such importance in a more worthy manner.



"These worms are met with in the more mountainous districts of Kweichow, and also in some parts of the province of Szchuen, as, for example, Ki-kiang, San-tchouen, and Pa-hien. Although they may be reared advantageously in various localities, their favourite location is in Kweichow, on the highest mountains, where the air is cooler and purer than elsewhere. As the mulberry-silkworm succeeds best in warm countries, you will doubtless be surprised, as was M. Hébert, one of the French delegates in China, to hear that these worms succeed better on the mountains than in the plains, where the climate is milder. Such is the case, however, as proved by long native experience, and by the fact that in the mountains there are two crops of silk annually, whilst in the low grounds the worm yields only one, and that much inferior to the first one from the higher regions—showing that the oak-silkworm requires a cold rather than a warm temperature.

"The management of these worms is altogether different from that of the ordinary silkworm. They are reared on the trees, not in houses. As soon as they are hatched they are taken to the hills and placed on the trees. If it were attempted to raise them at home, by supplying them with oak-leaves, in the same way as mulberry-leaves are given to the common silkworm, they would die without tasting the leaves, which they require to eat on the tree, and to pick out for themselves. The oaks on which they feed require no particular care; they are in their natural state. I may here say a few words regarding these trees. There are two of them in China, one called *Ts'ing-kang*, the other *Fu-li*: these two species differ but little; and in order to distinguish them it is necessary to examine them very closely. The only difference consists in the leaves, and the hardness of the wood. The *Ts'ing-kang* is harder than the *Fu-li*; its leaves are long and toothed, and somewhat like those of the chestnut. The *Fu-li* has shorter and broader leaves; so far as I can judge, it is identical with our French oak, at least that of Le Velay; for I have never examined the oaks of other provinces. Although the worms eat both kinds, they prefer the *Ts'ing-kang* to the *Fu-li*. The oaks are never allowed to grow old here; every eight or nine years they are cut down to the ground; the subterranean trunks throw up new shoots, which are again cut down after the lapse of another eight or nine years, so that the oak woods are merely copses. All the mountains hereabouts are covered with these trees.

"Ten or eleven days after the oak-moths have laid their eggs, thousands of little black larvæ are seen moving about the basket, which are immediately carried to the hills, and deposited on the trees, the leaves of which (for it is only the end of March or the beginning of April) are only half expanded. Here they are left night and day, in rain or wind. There is no need to watch them by night; but some one keeps at hand during the day to frighten away the birds, and to help the worms to pass from one tree to another, and pick up such as may have been blown down or have fallen to the ground.

"The worms change colour four times: at first they are black, later violet, some afterwards yellow, and finally a blackish violet. It takes forty or fifty days to attain this last stage; and they are then as thick as a man's little finger. They show a special instinct in protecting themselves against the weather; when it rains they move to the under surface of a leaf, and when cold winds prevail they shelter themselves on the least-exposed side of the leaf. Towards the end of March 1840 I was staying amongst a Christian community where these worms were reared in great numbers; on the 28th the newly hatched worms were on the trees, on the 30th snow fell, and the three succeeding days were so piercingly cold that within doors it was impossible to leave the fire. I said to my Christians, 'Your silkworms will surely all die with this weather.' 'Oh! no,' they answered, 'they are a little numbed by the cold, naturally, but they won't die.' Nor did they; for, happening on the 3rd of April to pass by the place where the worms were on the trees, I saw them eating greedily.

"After devouring the leaves for forty or fifty days, they begin to spin cocoons, which are rather more than an inch long, as thick as a walnut, and of a somewhat whitish-yellow colour. As some worms are always stronger than the others, so also there are cocoons of a larger size than usual. They are spun on a leaf rolled round into a hollow cone or funnel; and if one is not sufficiently large, two are fastened together. The worms commence by weaving the outside of the cocoon, in which they then shut themselves up and spin the remainder, the whole task occupying only three days. The date of collection of these cocoons varies according to locality; thus in the plains and at slight elevations, they are gathered in from the 20th to the 24th May, or a few days later, whilst on the mountains of Qweichow this is not done until the 15th to 20th June. Here also, vegetation being in arrear, the silkworms are hatched later.

"In the mountainous districts of Qweichow, and even in some parts of Szchuen, all the grubs are not killed, but a small quantity of the cocoons are kept, to raise at once a second crop. At low elevations, however, but one crop is raised, as a second would not repay the time and trouble of rearing, owing to the heats of July and August, which would prove fatal to the greater proportion of the worms.

"On the higher mountains, where the nights are always cool, and the heat is tempered by the constant breezes, and where insect enemies are rare, the worms grow as vigorously as the first brood. The second crop is gathered about the 1st October.

"The produce of these oak-worms, although inferior to that of the ordinary silkworm, is nevertheless very fine and very strong, and when woven yields a very pretty bright fabric. I believe a great deal might be done with this silk in France, and that our Government is quite right in looking at the acclimatization of the oak-silkworm as a matter of considerable importance."

The preceding extracts are suggestive in several respects. Thus I suppose that the somewhat obscure statement of the Chinese Cyclopædia as to the identity, except in size and bearing of fruit, of the *Ts'ing-kang* and *Siang-li*, may be elucidated by the information given to and recorded by Dr. M'Cartee, that only young trees are used for rearing silkworms on, and by Père Bertrand's statement that, in Qweichow, young trees, or the new growths sent up from the stumps of felled ones, are alone employed for this purpose. This would show a great uniformity in one particular in very distant parts of China; and it is quite possible that, as with animals amongst our stock-breeders and fanciers at home, so here, one species of oak may, at different ages, and according to whether it is available or not for a special purpose, receive two distinct substantive names. Another point worthy of attention is the affinity of the several oaks employed (as far as these have been scientifically determined) to those of Europe and Western Asia. To this I have already adverted in my first paper, mentioned at the commencement of these notes; and if, as I think likely, the oak here figured is the ***Fu-li*** (supposed to be identical with *Q. robur* by Father Bertrand), there is little doubt of the tolerably close relationship of the two. Having now for several years past paid more than ordinary attention to the genus *Quercus*, I may say (I hope without incurring the charge of presumption) that I believe the specific limits of the *Lepidobalani* of the Eastern Hemisphere are most vaguely and unsatisfactorily defined, and am by no means satisfied of the distinctness of several of those of north-eastern Asia. Similar doubts have been expressed by several European botanists; but the total disagreement of writers as to *which* are good species, even amongst well-known forms, is perhaps the most convincing proof of the uncertain *status* of many members of the group.

I do not, I think, in fact, and certainly not in intention, wrong French advocates of acclimatization, when I assume that they are, as a rule, rather too enthusiastic as to the results of their pet projects; but I see no reason to alter the opinion I expressed formerly (long before I was cognizant of M. Bernard's excellent notice), that all circumstances would seem to conspire to render the culture of the oak-silkworm in Europe a sure matter of success, if properly set on foot and fostered. On its importance, if successful, there is no need to enlarge.

It is curious to know, from independent sources both native and foreign, that the rearing of a silkworm on oaks is carried on in the south-west as well as the north-east of this vast empire; and it will be a matter of great interest to ascertain whether any oak is employed for the same purpose in northern Burma or Assam, in both of which the genus *Quercus* is a characteristic type of vegetation, and from which Kweichow is only separated by the province of Yunnan.

British Vice-Consulate,
Whampoa, Sept. 1870.

Note on the Genus *Byrsanthus* (Guill.) and its Floral Conformation. By MAXWELL T. MASTERS, M.D., F.R.S., F.L.S.

[Read January 19, 1871.]

THIS genus, which was established by Guillemin*, is closely allied to *Homalium*, if not indeed identical with it. Endlicher rejected Guillemin's name, and substituted that of *Anetia* †, on the ground that a genus of *Lobeliaceæ* had received at the hands of Presl the very similar designation of *Byrsanthes.* Bentham and Hooker *, however, keep up the original designation of Guillemin, expressly stating that they have no personal acquaintance with the genus in question, and copying the characters assigned to it from Endlicher, who, in his turn, probably availed himself of the original description of Guillemin. Guillemin founded the genus on a specimen which he considered identical with a plant briefly alluded to, but not named or fully described, by Robert Brown. This conjecture I believe to be incorrect; and it is with a view of rectifying this error that I venture to lay before the Society the present communication, in which I shall also allude to the structural arrangement of the andrœcium.

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* Deless. Ic. Select. Plant. iii. 30. t. 52.

† Gen. Pl. p. 923. n. 5088.

Brown's original notice of the plant was founded on a specimen gathered in Congo by Christian Smith, and is couched in the following terms †:—"In the collection from Congo a plant occurs, evidently allied, and perhaps referable to, *Homalium*, from which it differs only in the greater number of glands alternating with the stamina, whose fasciculi are in consequence decomposed, the inner stamen of each fasciculus being separated from the outer by one of the additional glands. This plant was first found on the banks of the Gambia by Mr. Park, from whose specimens I have ascertained that the embryo is enclosed in a fleshy albumen."

Here, then, we have the plant first noted by our illustrious compatriot, and also the circumstance that the plant in question is indigenous in the region of the Congo and the Gambia, two widely separated districts. Guillemin's figure and description were taken from a plant collected in Senegal by Heudelot. Acting on the conviction that the specimen gathered by the last-mentioned collector belonged to the same species as that alluded to by Brown, Guillemin described it fully, figured it, and gave it the name of *Byrsanthus Brownii.*

The examination of the specimens collected by Chr. Smith, and comparison with the figure and description given by the French botanists, lead me to infer that we have to deal with two distinct species, and, further, that the plant of Guillemin is not the same as the one mentioned incidentally by Brown. The principal points of distinction are to be found in the circumstances that in Brown's plant the ovary is wholly inseparate from the flower-tube, while in the species described by Guillemin the ovary is half superior; moreover the petals in the specimen collected by Chr. Smith are patent, while in the description and figure given by Guillemin the petals are connivent *.

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* Gen. Pl. i. p. 800.

† R. Brown in Tuckey's Congo, Miscell. Works, ed. Bennett, vol. i. p. 120.

But the great interest attaching to these plants resides in their curious morphological structure. Owing to the great thickness and opacity of the parts of the flower in the dried plant, it is not altogether an easy matter to determine accurately the relationship of the several parts. An examination of recent specimens in all stages of development is, indeed, necessary for their full comprehension; nevertheless from the evidence before me, and from the analogies offered by allied genera, I believe the structure to be correctly interpreted as follows:—

From the summit of the top-shaped flower-tube emerge five (rarely six) ovate leathery valvate sepals. Within, and alternating with the sepals, originate the petals, of the same number and form as the sepals, but larger, thicker, and more induplicate at the margins, and hence somewhat concave. Within the petals are two or three series of fleshy cushion-like glands intermingled with stamens. The difficulty before alluded to consists in ascertaining the precise relative position of the glands and stamens, and in consequence their exact morphological significance.

If my interpretation be correct, the arrangement is as follows:—

First row of 5 or 6 sepals; second of 5 or 6 petals; third of glands and stamens thus disposed:—in front of each sepal one gland; in front of each petal one gland, flanked on either side by a fertile stamen: fourth row of glands and stamens, one gland before each sepal, one perfect stamen before each petal;

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* The two species may briefly thus be characterized; a fuller description will appear in the forthcoming (second) volume of the 'Flora of Tropical Africa,' while certain structural details are alluded to in the context:—

BYRSANTHUS BROWNII, *Guill. in Ic. Deless.* iii. p. 30, t. 52. Foliis ovali-oblongis; petalis conniventibus; ovario basi tantum cum floris tubo coadunato; stylis in tubum fusiformem inferne coalitis.

Hab. Senegal, Coll. *Heudelot.*

B. EPIGYNUS, *Mast.*, sp. nov. Foliis oblongis; petalis patentibus; ovario omnino cum floris tubo coadunato; stylis divergentibus omnino liberis vel imo basi tantum coalitis.

Hab. Gambia, *Park*; Congo, *Chr. Smith.*

this latter stamen is therefore separated from the centre of the petal by a gland belonging to the outer series. Fifth row or gynæcium, ovary connate with the flower-tube, or more or less free from from it, one-celled, with 5 parietal placentas supporting numerous ovules. Styles coherent at the base, or free.

The arrangement of the stamens and glands may be more clearly made evident by the following diagram, where S represents the sepals, P the petals, × the glands, st the stamens.

S		S		S		S		S	
	P		P		P		P		P
×	st×st	×	st×st	×	st×st	×	st×st	×	st×st
×	st	×	st	×	st	×	st	×	st

Guillemin describes the position of the stamens and glands almost precisely in the same way :—"Stamina duplici serie disposita numero triplici petalorum, duobus exterioribus ad latera cujusque petali, glandula interjecta; uno interiore ante glandulam petalo oppositam glandula hinc et illinc comitato."

In the diagram given in Delessert's 'Icones,' the artist committed an error, to which Guillemin thus alludes :—"In serie interna glandularum et staminum duæ glandulæ collaterales inter stamina errore gravi delineatæ fuerunt dein unica glandula reipsa exstet inter stamina." It is the more necessary to call attention to this correction, as Lindley, in the 'Vegetable Kingdom,' p. 742, has repeated the diagram without making the necessary alteration.

Adverting now to the arrangement of the andrœcium in some nearly allied genera, we find the most simple condition in *Blackwellia* (*Homalium* § *Blackwellia*, Benth.). Here there is a single stamen in front of each petal, and no glands at all. *Nisa* (referred to *Homalium* by Bentham and Hooker) is described as having a similar structure, but with a gland between each pair of stamens. In *Casearia*, which is not quite so closely allied to *Byrsanthus* as the preceding, we have a single series of fertile stamens alternating with petaloid staminodes. In *Bivinia* the stamens are grouped in fascicles between the sepals, and there are five glands opposite to the sepals. The petals are absent in this genus.

In *Dissomeria* and in *Homalium* § *Racoubea*, the stamens are numerous, and arranged in fascicles before the petals. In *Myriantheia* (referred by Bentham and Hooker to *Homalium*) a similar arrangement is described. On either side of the fertile stamens of *Lunania* are two glands, or probably the glands are bilobed, as in *Osmelia.* As my examination of the genera just alluded to has been but superficial (except in the case of *Homalium* and *Casearia*), I would not express myself too confidently as to the exact disposition of the andrœcium and the glands in those particular genera. It suffices for my present purpose to show that the general tendency is to have one fertile stamen or a group of such in front of each petal, alternating usually with glands. In some cases there is but one row of such organs; while in other instances there are two, and possibly even three.

From the circumstances just alluded to, I think I am justified in inferring that the groups of glands and stamens in front of the petals of *Byrsanthus* are strictly homologous with the phalanges of stamens in *Bivinia* &c.; and I would further propose the following interpretation of the morphology of the andrœcium in the genus under consideration.

The outer row of the andrœcium consists of ten stamens—five opposite to the sepals, and existing in the form of glands, and five *compound* stamens opposite to the petals, and consisting of a central barren portion or gland, and two fertile filaments, one on each side of the gland. The inner row of the andrœcium consists likewise of ten stamens—five represented by glands placed in front of the sepals, five by fertile stamens superposed to the petals.

An examination of the course of development can alone demonstrate whether or not this interpretation is correct; in the mean time I may state that my inference is based on the examination both of mature flowers and of young unopened buds.

Before passing from the consideration of the andrœcium of *Byrsanthus*, it may be well to allude to the æstivation of the stamens, as that is a point on which some stress has been laid of late by Clos and others. The filaments of *Byrsanthus epigynus* are slender, widely spreading, and straight in the expanded flower, but incurved and even spirally twisted in the bud. The anthers are small, subglobose, didymous, 2-celled, bursting outwardly by two longitudinal chinks, and surmounted by a short thickened process continuous with the connective.

With reference to the position of the ovary of *Byrsanthus*, the difference in the case of the two species herein mentioned would be sufficient, in many cases, for the establishment not only of a new genus, but would justify the position of the two plants in two different orders or even subclasses. But such differences in *Homalineæ* are, as remarked by Brown *, of comparatively little moment. "The cohesion [adhesion] of the ovarium with the tube of the perianthium, though existing in various degrees in all the genera above enumerated, is probably only a character of secondary importance in Homalineæ; for an unpublished genus, found by Commerson in Madagascar, which in every other respect agrees with this family, has *ovarium superum*." Brown also pointed out the circumstance that the stamens are opposite to the sepals in *Passifloreæ*, while in *Homalineæ* they are opposite to the petals.

As to the question whether *Byrsanthus*, as a genus, is sufficiently distinct from *Homalium*, opinions will naturally differ. The main differences consist in the petals and the increased number of glands in the andrœcium. Now, if we adopt Bentham's views † and combine *Blackwellia* with *Homalium*, we have equal reasons for including *Byrsanthus* also in the same generic group as a well-marked section. Nevertheless, in the absence of ripe fruit and of better materials than have been at my disposal, it seems better to retain Guillemin's genus as distinct.

Historical Notes on the *Radix Galangæ* of Pharmacy.

By DANIEL HANBURY, Esq., F.R.S. and F.L.S.

[Read January 19, 1871.]

IN discovering and describing the plant which yields the *Radix Galangæ minoris* of pharmacy, Dr. Hance has added an interesting chapter to the history of a substance which for many centuries has been an object of trade between Europe and the East. Galangal does not, indeed, possess properties which can claim for it the rank of an important medicine, being simply a pungent aromatic of the nature of ginger; but it has so long held a place in the pharmacopœias of Europe, and enters into so many ancient receipts, that I need hardly apologize for offering to the Linnean Society a few notes on its pharmacological history.

Galangal was apparently unknown to the ancient Greeks and

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* *Loc. sup. cit.*

† Journ. of Linn. Soc., Botany, vol. v. Suppl. p. 87.

Romans; at least no mention of it can be found in the classical authors. Its introduction into Europe was due to the Arabians, in whose writings it is noticed at a very early period.

Thus Ibn Khurdádbah, an Arab geographer who served under the Khalif Mutammid, A.D. 869–885, has left some information respecting China, after which he speaks of the country of Sila, which exports . . . . . musk, aloes [*i. e.* aloes-wood], camphor, ... porcelain, satin, cinnamon [cassia], and *galangal* *.

The celebrated geographer Edrisi, who wrote A.D. 1154, observes of Aden, that it is the port for Scinde, India, and China, from which last country are brought musk, aloes-wood, pepper, cardamoms, cinnamom, *galangal*, mace, myrobalans, camphor, nutmegs, cloves and cubebs †.

The Arabian physicians, from Rhazes and Alkindi in the tenth and eleventh centuries downwards, make frequent reference to galangal as an ingredient of the complicated medicines then in use.

Among the later Greeks I cannot find any mention made of this drug prior to Myrepsus, who probably resided as physician at the court of the Greek Emperors at Nicæa in the thirteenth century; though several authors declare it is referred to much earlier. It is constantly named by Actuarius, who may have been contemporary with Myrepsus.

In a work published some years ago in Paris, entitled 'Assises de Jérusalem, ou Recueil des Ouvrages de Jurisprudence composés pendant le xiii^e siècle dans les Royaumes de Jérusalem et de Chypre' ‡, there is a remarkable list of commodities liable to to duty during the twelfth century at the port of Acon in Syria (the modern Akka), at that period a great emporium of Mediterranean trade, in which many Indian spices and drugs, including *galangal*, are enumerated.

We find galangal also noticed, together with ginger and zedoary, as productions of India imported into Palestine, by Jaques de Vitri, Bishop of Acon in the early part of the thirteenth century §; and in the 'Romance of Godefroi de Bouillon,' a poem written in the twelfth century, it is named as one of the rarities of the East, which the Crusaders were deluded into believing would be found in plenty in the Holy Land *.

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* "Le Livre des Routes et des Provinces, par Ibn Khordadbeh, traduit et annoté par C. Barbier de Meynard," Journ. Asiatique, sér. vi. tome v. (1865), p. 294.

† 'Géographie d'Edrisi,' traduite par A. Jaubert, Paris, 1836–40, 4to, tome i. p. 51.

‡ Paris, 1841–43, fol. tome ii. chap. 142.

§ Vitriaco (Jac. de), 'Historia Orientalis et Occidentalis,' 1597, 8vo, p. 172.

Marco Polo, in his travels in Asia in the thirteenth century, observed galangal to be produced in Southern China (Province of Foochow ?), as well as in Java †.

About this period it was also known in Western Europe. St. Hildegard, Abbess of Bingen, who died in A.D. 1179, names it as *galgan*, and comments upon its medicinal virtues ‡.

Galangal is catalogued with other spices (as ginger, cinnamon, cloves, and nutmegs) in the tariff of duties levied in the port of Colibre (Collioure), in Roussillon, in A.D. 1252 §.

A more interesting notice of the drug is contained in the journal of expenses of John, King of France, from July 1, 1359, to July 8, 1360, during his residence in England, preserved in the 'Comptes de l'Argenterie des Rois de France.' Besides purchases of sugar, mace, ginger, cloves, pepper, cardamoms, calamus aromaticus, and many other drugs, we find three entries for *galangal*, namely, for ½ lb. 18*d*., for 2 lbs. 6*s*., and for 1 lb. 22*d*.‖ As the price of gold happens to be also mentioned in one part of the account, it is easy to form an estimate of the relative value of galangal. This shows the price of 3*s*. per pound to be equivalent to about 10*s*. of our present money—not extravagant for a commodity transported from the remotest Asia to the centre of England.

In Professor J. E. Thorold Rogers's 'History of Agriculture and Prices in England,' there are eleven entries indicating the price of galangal in England between A.D. 1264 and 1376. The highest was in 1307, when 2 lbs. of the spice purchased for the Crown were paid for at the rate of 6*s.* 8*d.* The other entries indicate the price as from 1*s.* 6*d.* to 3*s.* per lb.

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* 'Bibliothèque de l'Ecole des Chartes,' tome ii. (1840–41), p. 437.

† 'Le Livre de Marco Polo' (éd. Pauthier: Paris, 1865), pp, 522, 561.

‡ 'S. Hildegardis Abbatissæ Opera omnia,' accurante J. P. Migne, Paris, 1855, p. 1134.

§ Capmany, 'Memorias Historicas sobre la Marina, Comercio y Artes de la Ciudad de Barcelona,' 1779, tomo ii. p. 20.

‖ The original entries are as follows:—

"Lundy VII^e jour d'octobre. Jehan Kelleshulle, espicier à St. Boutoul, pour espices prises de li pour le Roy.... Galingal, demie livre 18*d*. Jeudy XIII^e jour de février.... Galingal, 2 livres, 6*s*. Samedy XXVII^e jour de juing.... Berthélemi Mine, espicier.... Galingal, une livre, 22*d*....."

L. Douet D'Arcq, 'Comptes de l'Argenterie des Rois de France au XIV^e siècle.' Paris, 1851, 8vo. pp. 218, 232, 265, 266.

In the fifteenth century galangal was evidently in common use; for Saladinus, physician to one of the Princes of Tarentum, *circa* A.D. 1442–1458, reckons it among the things *necessaria et usitata* which should be found in the shop of every *aromatarius**. As might be expected, it is included in all the older pharmacopœias and antidotaria.

Garcia D'Orta, first physician to the Portuguese Viceroy of India at Goa, and a resident in India for thirty years, is, I think, the first writer to point out (1563) that there are two sorts of galangal—the one, as he says, of smaller size and more potent virtues brought from China, the other a thicker and less aromatic rhizome produced in Java†.

This distinction is perfectly correct. The Greater Galangal, which is termed *Radix galangæ majoris*, is yielded by *Alpinia Galanga*, Willd., a plant of Java‡; the lesser, called *Radix galangæ minoris* or simply *Radix galangæ*, is derived, as we now know, from the plant which Dr. Hance has described as *A. officinarum*. It is the latter drug alone that is at present found in European commerce§.

The name *galangal*, *galanga* or *garingal*, *Galgant* in German, is derived from the Arabic *khalanjān*; whether that word may be a corruption of the Chinese name *liang-kiang*, signifying *mild ginger*, I must leave it to others to decide.

Let me say a few words regarding the uses of galangal. As a medicine, the manifold virtues formerly ascribed to it must be ignored; the drug is an aromatic stimulant, and might take the place of ginger, as indeed it does in some countries. That it is still in use in Europe is evident from the exports from China and from the considerable parcels offered in the public drug sales of London‖.

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* 'Compendium Aromatariorum,' Bonon. 1488, fol.

† 'Colloquios dos Simples e drogas he cousas medicinais da India,' Goa, 1563, Colloquio 24.

‡ *Maranta Galanga*, Linn., Sp. Pl. and Swartz, Obs. Bot.

§ Moodeen Sheriff, in his learned 'Supplement to the Pharmacopœia of India' (Madras, 1869), states that in the bazars of Hyderabad and in some other parts of India the rhizome of *Alpinia calcarata*, Rosc., is sold as a sort of galangal; and that a species of *Alpinia* growing in gardens about Madras, which, conceiving it to be new to science, he has described and named as *A. Khulinjan*, has a rhizome much resembling the Lesser Galangal of China.

‖ Three hundred bags, each 112 lbs., imported from Whampoa were offered

The chief consumption, however, is not in England, but in Russia [*]. It is there used for a variety of purposes, as for flavouring the liqueur called *nastoika.* The drug is also employed by brewers, and to impart a pungent flavour to vinegar, a use noticed by Pomet [†] so long ago as 1694. As a popular medicine and spice, it is much sold in Livonia, Esthonia, and in Central Russia; and by the Tartars it is taken with tea. It is also in requisition in Russia as a cattle-medicine; and all over Europe there is a small consumption of it in regular medicine.

There is doubtless some quantity of galangal of both sorts used in India. By a 'Report on the External Commerce of the Presidency of Bombay for the year 1865–66' I find that there was imported into the port of Bombay of "*Gallingall*" from China 520 cwt., from Penang, Singapore, the Straits of Malacca, and Siam 70 cwt., and from ports in Malabar 834 cwt. Of the total quantity (1424 cwt.), 716 cwt. was reshipped to the Arabian and Persian Gulfs.

According to Rondot, writing in 1848, the trade in this drug is on the decline [‡]; and the statistics which I have examined tend strongly to show that this is the fact.

The foregoing notes may be thus summarized:—

1. Galangal was noticed by the Arab geographer Ibn Khurdádbah in the ninth century as a production of the region which exports musk, camphor, and aloes-wood.

2. It was used by the Arabians and later Greek physicians, and was known in northern Europe in the twelfth century.

3. It was imported during the thirteenth century with other eastern spices by way of Aden, the Red Sea, and Egypt, to Akka, in Syria, whence it was carried to other ports of the Mediterranean.

4. Two forms of the drug were noticed by Garcia d'Orta in

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for sale by Messrs. Lewis and Peat, 27 Oct., 1870. The quantity was not thought remarkable; and I am assured that a single buyer will sometimes purchase such a lot at one time for shipment to the continent.

[*] Professor Regel, of St. Petersburg, and A. v. Bunge, of Dorpat, and Mr. Justus Eck, of London, have all obligingly supplied me with information as to the use of galangal in Russia. My thanks are also due to my friend Professor Flückiger, who on this, as on other occasions, has kindly offered me valuable suggestions.

[†] 'Histoire des Drogues,' Paris, 1694, fol., part 1, p. 64.

[‡] 'Commerce d'Exportation de la Chine,' Paris, 1848, p. 98.

1563; these are still found in commerce and are derived respectively from *Alpinia Galanga*, Willd., and *A. officinarum*, Hance.

5. Galangal is still used throughout Europe, but is consumed most largely in Russia. It is also used in India, and is shipped to ports in the Persian Gulf and Red Sea.

Remarks on the Tamil Popular Names of Plants.

By The Rev. S. Mateer, F.L.S.

[Read March 2, 1871.]

Having had the opportunity during a residence of some years in Travancore of becoming familiar with the popular names of plants in two of the vernacular languages, Tamil and Malayālim, I have drawn up for my own use somewhat complete lists of such names. In examining these vocabularies I have often noticed with interest traces of some of the mental peculiarities and notions of the Hindus, and obtained many little items of curious information. In offering a few remarks on this subject, I shall refer almost exclusively to the Tamil language, which is much more complete and highly cultivated than the Malayālim.

Considerable difficulty is experienced by Europeans in the attempt to ascertain from the natives the correct vernacular names of plants. Many of the people pretend to be acquainted with the indigenous plants, but are utterly incapable of recognizing or identifying the different species with any thing like certainty. Repeated questioning, careful cross-examination, and persevering inquiries in different parts of the Tamil country are necessary, in order to obtain a reasonable degree of assurance on many points connected with this subject. And it may be observed in passing that even in English works the transliteration into our own characters of the vernacular designations of plants is often executed with most discreditable carelessness and want of method or uniformity.

Great inaccuracy and a general absence of scientific system obtains in the Tamil botanical nomenclature. Some attempt, however, at a rough natural system of classification may be discerned in the native mode of naming plants which might, perhaps, to some little extent be availed of in the composition of botanical works in Tamil. Certain general terms are applied to classes of plants bearing some apparent resemblance or external similarity to each other; and the particular species is defined by an adjective or another noun preceding.

"Tutti," for instance, appears to signify mallows in general. Then there are ottututti = adhering or sticking mallows = *Urena sinuata,* so called from its having fruits which cling to clothing or other surfaces with which they come into contact. Kattututti= jungle- or wild tutti, is *Sida hirta,* Nila tutti = ground-tutti, is *Sida cordifolia,* and Perun tutti = great tutti, is *Sida asiatica,* and so on.

A similar use is made of such general terms as tāli = *Convolvulus,* kalli = *Euphorbia,* atti = *Ficus,* malligei = *jasmin,* tulasi = *mint* or sweet basil, kōrei = *Cyperus* or sedge, mulli = *thorn,* pāsi = *mosses* or aquatic plants, and others. These are qualified and defined as in many of our own popular names of plants by such nouns or adjectives as river, water, white, black, mountain, jungle or wild, dog, elephant, sea or maritime, foreign, &c. For example, āttumulli = river-thorn is *Dilivaria ilicifolia,* a pretty flowering acanthaceous plant, with leaves strikingly resembling those of the holly, which grows by the river-sides. Neer nochi = water nochi, is the small tree *Vitex trifolia*; pey karumbu = devil sugar-cane, is *Saccharum arundinaceum,* a wild and useless sugar-cane.

It is well known that the South-Indian or Dravidian languages are not Sanskritic in character or origin, though some of them have adopted a considerable proportion of Sanskrit words. Of the common names of plants, some are, as might be expected, Sanskrit; but the great majority are Dravidian. Many wide-spread and useful plants, such as the Plantain, Mango, Tamarind, and others, have names derived from both sources.

In seeking, however, to turn these popular names to account for a vernacular systematic nomenclature of plants according to the European natural system of classification, we find serious difficulties in the way. In the first place, great deficiencies in the list of general terms are at once apparent. There is no word, for example, applicable to the *class* or order of Palms, only proper names of each species; nor are there terms for Ferns and other important orders of plants.

Again, as might be expected, no really proper and distinctive names exist in these languages for plants which have been merely introduced, though now naturalized; *Allamanda,* for instance, is merely known as "yellow flower;" the *Cashew,* the Feringhee (or

Frank) or the Quilon Mango; *Poinciana pulcherrima* is Peacock Cassia; the *Bixa* or *Arnotta* shrub, monkey-yellow; the *Bapaw* is the Feringhee or the Curry Castor-oil; the *Casuarina*, wind-trembler or whip-tree, names suggested by the waving of the branches and the strange melancholy whisper of the wind through these trees, and by the use of their tough pliant branches as whips or rods. The potato is denominated "round root," and liquorice "very sweet root." *Lantana indica* also is simply "hedge-plant," being generally used for fences.

Not only are there many deficiencies, but serious and absurd errors occur in this rude mode of natural classification.

"Arasu," for example (which appears to mean "the royal tree"), is the correct designation of the noble and sacred *Ficus religiosa*; but *Thespesia populnea*, a malvaceous tree, is called "flowering arasu," Pūvarasu, which has come to be written in English *Portia*. And even *Trewia nudiflora*, a Euphorbiaceous tree, is dignified with the name of "āttu pūvarasu," the river flowering arasu. Here we have the same term applied to plants of three distinct and strikingly dissimilar orders.

Again, "vārei" is the common name of the various species of *Musa* (plantains or bananas); but *Canna indica*, or Indian shot, certainly not unlike a plantain in habit, if not in size, is "pūvārei," the flowering plantain; and even *Commelina benghalensis*, a mere straggling herbaceous plant, is called kānāvārei, forest-plantain.

"Tārei" (from "tār" to be low, to recline) denotes the *Pandanus* or screw-pine; but "kattārei," rock- or stone-tārei, is applied to *Aloë indica*.

"Tāmarei" is the *Lotus*, Water-Lily; but the Euphorbiaceous tree, *Macaranga indica*, is actually named "vattatāmarei," round or orbicular tāmarei, possibly from the slight resemblance which its large peltate leaves bear to the orbicular leaves of the *Nelumbium*. Then the fragrant labiate *Orthosiphon bracteatum* is called "rock-tāmarei," and *Pistia stratiotes* "āgāsa tāmarei," or sky-lotus, perhaps from some comparison of the water in which it floats while growing to the sky above.

All this is just what we might expect from a people so inexact and fanciful as the Tamilians, seizing the most trifling and accidental points of resemblance, and bestowing names upon plants almost at haphazard, without caring to investigate their essential and distinctive characters. The popular names of British plants, however, are often no better in this respect, as, for example, in calling *Epilobium* "the flowering Willow."

It is interesting to note the view taken by the Tamil people of many of the indigenous plants, as seen in the names given to those plants. A few of these may be mentioned.

The Cocoa-nut is called "tēnkay," honey-nut, showing the high estimation in which this valuable fruit is held.

The Plantain is "vārei," from the root vār, to flourish, prosper, from its remarkable exuberance of growth and fertility. Its stalks and fruit are therefore used on occasions of rejoicing as an emblem of prosperity and happiness.

The Tamarind is simply called "puli," the "acid" or "sour" tree.

"Tutti," used for Malvaceous plants, is from "tu," to eat, implying that some of these are edible, and intimating that it was early observed that plants of this order are wholly destitute of noxious qualities.

Cassia alata, "the ringworm-shrub," used to cure cutaneous eruptions, is called vandukolli = beetle- or bee-killer; and *Michelia champaca* is likewise known as "vandunā malar," the flower-tree untouched by beetles or bees. Perhaps the strong scent of the flower does repel bees, but I have not examined whether this be the fact.

Ipomœa tridentata is called "horse-killer."

Asclepias prolifera, the juice of which is used as an antidote to cutaneous disease, is named "nach aruppān" = the poison-killer or antidote to poison.

Names are bestowed upon plants, just as in our own language, from the resemblance which they are supposed to bear to some common objects. For example, the Fern *Hemionitis cordata*, which we compare in the trivial name to a heart, they call "dog's ear."

The pretty little golden Aster plant, *Inula indica*, is mukkotti = a gold ring set with a jewel, or a nose-jewel.

The long cylindrical Gourd which we compare to a snake, *Trichosanthes anguina*, they liken to the proboscis of an elephant (āneikōdan surei).

Utricularia stellaris is the "egg pāsi," and *Zannichellia indica* the "hair pāsi."

Other names are given from some obvious characteristic or sensible quality of the plant.

Dæmia extensa, a twining Asclepiad with white cottony hairs around the seeds and furnishing a fine fibre from the stem, is named "hedge-cotton." *Mussænda frondosa* is "white leaf," from its curious and beautiful white calycine leaf.

Crotalaria laburnifolia is "kilukiluppei" the "rattler," from the ripe dry seeds rattling in the legume, the very idea of our own botanical name from the Greek "krotalon" a rattle.

"Adutinnā palei," the "milk-plant which the goat will not eat," is *Aristolochia bracteata*, every portion of which is intensely bitter.

A few plants take their popular names from legendary tales or personages, like our St. John's Wort. Thus *Spinifex squarrosa*, a sea-side grass with spherical bristly inflorescence, is called "Rāvana's whiskers."

It may be interesting also to trace botanical terms belonging to the Tamil language now included in our own scientific nomenclature. Many of these Indian words are very oddly Latinized, and some of them quite misapplied. The following are some of the Tamil words thus adopted by us.

1. The Malabar nut, an Acanthaceous shrub, is *Adhatoda vasica*, in Tamil ādātōdei. Tōdei is used for various species of *Citrus*; ādā means immoveable or not shaking.

2. A genus of Xanthoxylaceæ is called *Ailanthus*. This word does not occur in Tamil; but in the cognate language, Malayālim, ārānthal is the name of *Ailanthus excelsus*.

3. The Pineapple is *Ananassa*. This is said to be derived from "nanas," the name in Peru, where the plant is indigenous. In Tamil, however, it is commonly called "annāsi" or "annatārei," the food or edible tārei or *Pandanus*.

4. A genus of lofty and graceful palms is called *Aréca*, which I should be inclined to pronounce *A'reca*. In Tamil, "kay" means fruit, and "adeikāy" pickled fruits. In Malayālim, however, "adekkā" is the appropriate name of the Betel-nut Palm, adopted in our botanical works.

5. The beautiful Papilionaceous genus *Agati* is simply in Tamil "agatti."

6. *Mangifera indica* is so named from "mā," the Tamil name of the tree, which, compounded with "kāy," becomes "mānkāy," corrupted by Europeans into "mango."

7. *Odina* in Anacardiaceæ is "uthiyam." *Pavetta* in Cinchoneæ is "Pávattei," which I should therefore pronounce Pávetta.

8. *Pongamia* is simply "pungu" or "punga," which, however, is said by Dr. Winslow to be applied to *Dalbergia arborea.*

9. *Zingiber* and Ginger, I believe, come from "inji," the green ginger root.

10. *Moringa pterygosperma,* the horse-radish tree, is in Tamil "murungei," from "murungu" to perish, dissolve, the wood being extraordinarily soft and perishable.

In the trivial names of plants also many Tamil names make their appearance.

1. Of this character I believe is the term galanga or galangal, applied to a species of *Alpinia.* This appears to be simply the South-Indian word "kirangu" or "kilangu," *root,* plural "kirangugal."

2. *Cassia Tora* is from "tagarei," the native name of the plant. *Cerbera Odallam* is a poisonous Apocynaceous tree, named in Malayālim "uthalam." *Euphorbia Tirukalli* is from "tirugukalli," twisted spurge, but appears to be misapplied to an unarmed species. The native name applies to *Euphorbia tortilis.*

3. *Chavica Betle* is the betel-leaf plant. The word betel is sometimes applied by English writers to the Areca-nut, which is chewed along with the leaf, but it properly denotes the latter only. The word in the original is "vettilei," from *verum* bare or plain, and *ilei,* leaf, which, according to the laws of Tamil euphony, becomes vettilei, and is corrupted by Europeans into "betel."

"Kiriāttu" is, I believe, the native name of *Andrographis paniculata*; while *Agathotes Chirayta* is commonly spoken of as the Chiretta herb. I think, however, I have observed that the natives call the former "country kiriāttu."

"Brinjal" is said in Prior's 'Popular Names of British Plants' to be a Tamil word; but this is certainly an error. I know not from what language the word really comes.

It may be worth noting, in connexion with this subject, that many of the names of places in South India are derived from the names of plants which abound in the respective localities. Such are Anjengo or Anjutenga = the five Cocoa-nut trees, and Callimere point or Kalli medu = Euphorbia-hill.

New Notes upon the Tremellineous Fungi and their Analogues.

By L. R. and C. TULASNE.

I. WHEN a special organization or a singular anatomical structure is common to a very great number of different beings, it is evident that the slightest modification of this organization or structure deserves the observer's attention; and this is particularly true if the modification affects an important apparatus, such as the reproduction in the basidiophorous fungi. This is the reason why, in this great family of plants, the little group of the *Tremellæ* and analogous species excites a peculiar interest. The Fungi Tremellinei, indeed, are not distinguished from other Basidiomycetes merely by their mucous consistency; for this occurs also in certain *Hydna*, in *Merulius*, &c.; they moreover present in the construction of their *hymenium* some peculiar characters which make it easy to recognize them. Their *basidia*, or hymenial and sporophorous cells, are shaped, as we have shown formerly *, after two distinct types. Some (for instance, those of the *Dacryomycetes* and *Guepinia Peziza* Tul.) are at first narrowly claviform, then they extend in two thick and divaricated arms or processes, each of which bears one reniform and divided spore. By this forked appearance, the basidia of the *Dacryomycetes* are easily distinguished from the similarly disporous, but obtuse, basidia of certain *Hypochni* and other non-mucilaginous *Hymenomycetes*.

The second type of basidia occurs amongst the genuine *Tremellæ*, where these sporophorous cells are subglobose, or quite spherical, and usually divided from the top to the bottom, into four equal parts. These segments become divergent from each other or remain united; but all grow, in the same way, into the form of long threads or tubes, which reach the periphery or superficies of the fungus, and there produce reniform and generally undivided spores.

If, notwithstanding M. Fuckel's contrary opinion, we admit, with the ancient mycologists, that an undoubted analogy unites the *Auriculariæ* with the *Tremellæ*, then we must mention a third kind of basidia, very distinct from the former ones; we mean the sporophorous tubes that M. De Bary has seen and described in *Auricularia sambucina* Mart. (*Hirneola Auricula Judæ* Berk.), consisting of upright and thick threads, each one being divided by transverse walls into four cells or stumps which throw out above long and fertile spicules. (See De Bary's 'Morph. u. Physiol. der Pilze' &c., p. 116, fig. 47, *a–c*.)

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* See the 'Ann. des Sc. Nat.,' 3rd ser., t. xix. (1853), pp. 193–231, pls. x.–xiii.

It is a condition common to these three types that the basidium and its appendices are filled with a granular and not very transparent plasma, which is wholly employed in forming the spores, so that when the latter have become perfect and mature the organs that have produced them are quite empty and transparent. It is moreover observed that the spicules are generally far thicker than is mostly the case amongst other *Hymenomycetes.*

II. An hymenium resembling that of the *Dacryomycetes* is found also in the *Caloceræ,* which, on account of their linear shape, have for a long time been mixed up with the *Clavariæ*; but the real or legitimate affinities of the former are now understood and interpreted by the most able mycologists, such as MM. de Bary and Fuckel, in the same manner as that already adopted by ourselves. (See 'Ann. des Sc. Nat.,' 3rd ser., t. xix.)

In the *Tremella helvelloides* DC., a beautiful species, the structure of which has hitherto remained unknown, we have met with basidia that are forked almost like those of the *Dacryomycetes,* but nearly as globose as those of genuine *Tremellæ.* This fungus, which M. Fries has justly removed from the *Tremellæ* to his group of the *Guepiniæ,* differs nevertheless from several of the latter in being fertile on the under surface. In *Guepinia Peziza* Tul., the hymenium is only spread on the superior and cup-like face of the plant, exactly as is usual amongst the *Pezizæ.*

We give here a short description of *Guepinia helvelloides* Fr.

Guepinia helvelloides *Fr. El. Fung.* parte alt. p. 31.—Tremella helvelloides *DC. Fl. Fr.* t. ii. p. 93.—Tremella rufa *Jacq. Miscell. Austr.* t. i.—Gyrocephalus juratensis *Pers. in Actis Soc. Linn. Par.* ad ann. 1824, p. 77.—Fungus gregarius, terrestris, gelatinoso-carnosus, tenax, totus carnei s. purpurascentis coloris, cujus pileus tenuiusculus, primo quasi spathuliformis, adultus autem semiorbicularis v. obovatus, diametro 1–2-pollicaris, maxime repandus aut saltem conchatus, et circumcirca attenuato-recurvus, insistit in stipite laterali, omnino sibi consubstantiali, compresso, sæpius canaliculato, verticali aut obliquo, altitudine vario, sæpius vero circiter pollicari basique velutino; superna pilei istius pagina tandem ob papillas lineares dense erectas velutina, albida et quasi farinosa, vulgo plane sterilis nec nisi rarissime parcissimeque sparsim sporophora deprehenditur; adversa e contrario pagina, quæ scilicet deorsum spectat, tota glabra et fertilis,

interdum venis paucis prominulis, *Meruliorum* more, instructa; basidia obovato-globosa tandemque bipartita, sterigmata duo linearia, longa, divaricata exserunt quibus singulis spora ovata v. brevissime oblonga, sæpe quadantenus curvula, utrinque tandem obtusissima, brevissima, 0·01 millim. longa et 0·004–0·007 crassa, debito tempore insistit.

Crescit sero autumno in pinetis et fagetis montanis sæpissimeque series describit lineares. Frequentem vidimus in sylvis Carthusianis prope Gratianopolim Delphinensium, exeunte Septembri a D. 1857; longe rariorem contra a. 1859, mense eodem.

Sporæ forma et crassitudine variant; pulveris instar albidi posticam s. inferam pilei faciem humidæ, cumulatæ velant, quam cultelli ope si raderis, hanc farinam non ægre colliges. Sporæ recentes, basi acutiusculæ, quidquam sterigmatis aliquando retinent, ocellumque pallidum sub medio tegmine monstrant; endochroma seu plasma contentum in guttam oleosam crassam mediamque tandem pro maxima parte vertitur. Sporæ ex alterutro apice, rarius e latere, germen filiforme protrudunt.

Fungus truncis, quisquiliis foliisve putridis vulgo sedet, ejusque mycelio involvi quandoque suspicati sumus lapillos illos seu calcareas concretiones quas trunci isti corrupti suis in penetralibus fovebant; cæterum hi lapilli albidi, licet nucis avellanæ et quod excedit crassitudine, oblongi autem et varie compressi, ejusdem omnino naturæ videbantur atque nuclei longe minores quos in *Tremella* v. *Næmatelia* quadam mauritanica olim videramus. (*Cfr.* Ann. Sc. Nat. ser. 3, t. xix.)

III. Since our first paper upon the *Tremellini*, we have found in *Tremella frondosa* Bull., and *T. albida* Huds., an hymenial or fertile apparatus quite similar, so far as regards the tetrasporous basidia, to that of *Tremella mesenterica* Retz. The fine groups of *Tremella frondosa* which we gathered in January 1863, on the dried stump of an oak in the forest of Meudon, near Paris, did not measure less than 15–20 centim. in diameter; they were of a very pale flesh-colour, inclining to yellowish; the membrane of the fungus is thin, corrugated, or like crumpled stuff, and dissolves into aqueous mucilage. Each basidium is formed of three or, more frequently, four globose cells which at last become almost detached from one another and terminate in flexuous spicules 0·03–·05 millim. long; the spores are shortly ovoid, and in germination become very nearly spherical.

In *Tremella albida* Huds., which we met with in December 1861 on the bark of a Sycamore (*Acer Pseudoplatanus*), the elements or parts of the basidia remained united, and its spores were crescent-shaped and blunted at each end.

After having attentively examined many *Tremellæ*, we cannot help suspecting that M. Fuckel is mistaken in imagining that *Tremella foliacea* Pers. is a conidiophorous form of *Bulgaria inquinans* Fr.* Such an opinion, indeed, would lead one to affirm that this so-called *Tremella foliacea* is not a genuine *Tremella* at all, if M. Fuckel's plant is the same as that described by Persoon; but, on the other hand, we can hardly suppose that the epithet *foliacea* would have been applied to the genuine conidiophorous *Bulgaria inquinans*, such as we have seen and described it in the 'Annales des Sciences.'

We will here mention a peculiar *Tremella* which grows as a parasite on *Sphæria strumella* Fr., and which, most probably on account of this, has acquired its strange name, although nobody, as far as we know, has ever remarked the habitual presence of this parasite on the old *pulvinuli* of the *Sphæria* above mentioned. We do not mean to say that parasitic *Tremellæ* have never been mentioned; but several of those which have been so called seem rather of an ambiguous nature. No such doubt can exist about our *Tremella neglecta*; for by its organization it resembles completely *T. frondosa* and *T. albida*. However, we must confess that we have never as yet seen its globose or quadripartite basidia producing sporophorous spicules. This gap will certainly be filled up some day, and there is therefore no reason why we should not give the following description of the new fungus:—

TREMELLA NEGLECTA†, pulvinulis natura de more gelatinosis, globosis, perexiguis, sordide albidis, strato mucoso crasso superne vestitis; basidiis (supra dicto strato retectis) breviter pedicellatis, globosis aut nonnihil pyriformibus, primum integris et obtusissimis, postea autem ad basim usque quadripartitis, divisuris tandem plus minus divaricatis, quadantenus sursum acutatis et verisimiliter in sterigma sporophorum singulatim productis.

Parasitatur hiemali tempore in cæspitibus obsoletis *Sphæriæ strumellæ* ribicolæ cujus rostris porrectis vulgo asperatur; quum autem amplius crevit, eadem rostra immersa aut plus minus latitantia arcte fovet.

Sexcenties vidimus in ramis et sarmentis emortuis *Ribis rubri* sylvestris, circa Cadvillam Versaliorum, locis sylvarum opacis udisque.

Fungillus, nisi adoleverit et jove pluvio favente intumuerit, ægre dignoscitur, sæpissime vero latens adest; semper matricem suam quasi strumosam efficere videtur. Hujusce conceptacula solita, non obstante *Tremella* insita, rite informantur, paucas autem sporas, ni fallimur, pleraque maturare valent.

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* See Fuckel, Symb. Mycol. p. 286.

IV. Basidia very analogous to those of the *Tremellæ* have been observed by Mr. Fred. Currey in a peculiar *Hydnum,* scarcely less gelatinous than the former, and therefore named by Scopoli *Hydnum gelatinosum* * (see the Proceedings of the Linn. Soc. for 1860). But this observation does not seem to invalidate the close analogy of this fungus with the most genuine *Hydna*.

The case is different with two fungi hitherto ascribed to the group of the *Thelephoræ,* and which are found to possess exactly the hymenial structure of the *Tremellæ.*

We will first mention *Corticium incrustans* Pers. (Obs. Mycol. part i. p. 39. n. 82), which modern authors have placed amongst the *Thelephoræ* under the names of *Thelephora incrustans* (Fr. Syst. Myc. t. i. p. 448; Elench. part i. p. 214) and *Thelephora sebacea* (Fr. Elench. *l. c.*; Berk. Outl. of Brit. Fung. p. 440, pl. 17. fig. 6). It is a fungus which grows not unfrequently about Versailles in damp and dark woods at the end of summer; it creeps upon the earth and clings to its surface, adhering to every thing, dead or living; in spreading itself out it clothes stones and stems of herbs and shrubs, here and there even rising without interior supports in little columns or rough clavules, free or partly soldered to one another, thick and glabrous, or ending in bristling tufts, whence it has received the names of *Clavaria laciniata* Pers. (in herb. Thuill.) and *Thelephora clavarioides* Thuill. (in suopte herb.). The fertile *hymenium* of this singular vegetable is to be found chiefly where it becomes more deeply yellow or yellowish, and where its surface is more smooth; elsewhere the filamentous network of which it is composed is alone usually found. The threads of its tissue are very ramified, thin, and seldom provided with partitions; the *hymenium* is formed from the terminal cells, which proceed from the ultimate and thinnest branches of those threads. The basidia are ovato-globose, as in the *Tremellæ*; they measure about 0·013 millim. one way and 0·01 millim. the other way; and each one divides, according to its length, into two or three equal parts, which extend into as many fertile threads or spicules. These are but little divergent, and attain a length of 0·015 millim. to 0·03 millim. The spores are slightly reniform and simple, scarcely differing in form and dimensions from those of *Tremella mesenterica* Retz.; and they do not much exceed in length the hundredth of a millimetre;

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* See Fries, Syst. Mycol. t. i. p. 407.

frequently in germinating they produce secondary spores, after the manner of the spores of *Tremella violacea* Relh. (See the Ann. des Sc. Nat. 3rd ser. t. xix. pl. 12. fig. 12.)

Another *Corticium*, from the same author as the former, the *Corticium cæsium* Pers. (Obs. Mycol. part i. p. 15, pl. 3. fig. 6) or *Thelephora* (*Phyllacteria*) *cæsia* Fr. (Syst. Myc. t. i. p. 449, n. 2), presents a very analogous structure. It also is found on damp sand in forests; but it is far thinner and more brittle, and its dark colour is ash-blue. It does not, as far as we have ever seen, invade (like *Corticium incrustans*) the stocks of herbaceous plants and shrubs, or shoot forth from its surface any kind of clavules. Its outside is exactly like that of an applied or resupinate *Thelephora*. Nevertheless its hymenium is composed of globose basidia, which divide into two, three, or four equal parts, which produce afterwards as many linear sterigmata, four or five times as long as themselves. The spores of the fungus are just like those of *Corticium incrustans*.

The two plants of which we are speaking, and which have been placed amongst the *Thelephoræ*, are evidently very far from their natural allies; we propose to unite them to the Tremellineous fungi under the generic name of *Sebacina*.

Here are, then, two new diagnoses for our mycological catalogues.

1. SEBACINA INCRUSTANS *nob.*=Corticium incrustans *Pers. Obs. Myc.* part i. p. 39, n. 82.=Thelephora incrustans *ejusd. in sua Syn. Fung.* p. 577.=Thelephora sebacea *Pers. Myc. Europ.*; *Fr. El. Fung.* part i. p. 214; *Letell. Suppl. à Bull.* tab. 607; *Berk. Outl. of Brit. Fung.* p. 440, tab. 17. fig. 6; *Fuck. Symb. Mycol.* p. 29.= Thelephora clavarioides *Thuill. MSS. in suopte herb., nunc e thesauris Musæi Bot. Parisini.*=Clavaria laciniata *Pers. MSS. in herb. Thuilleriano* (minime autem *Thelephora laciniata* Pers., neque *Clavaria cristata* aliorum). Fungus recens natus *Atheliam* vel *Himantiam* niveam fingit, tenuis est ambituque fimbriatus s. laciniatus, pedetentim autem incrassatur, longius circumcirca protenditur et in medio sordide luteolus fit; simul etiam in conulos vel clavulas irregulares, obtusas et integras alias, laciniatas seu cristatas alteras, sparsim assurgit; nunc solo tenus undique applicatus obrepit, nunc sæpiusque quisquilia, herbas lapillosque simul investit. Basidia fertilia in partibus saturatius fucatis tantummodo generantur; hyphis exilibus de more terminalia ovatoque globosa insistunt, 0·013 millim. hinc, 0·01 millim. illinc æquant, adultaque ætate sterigmata quatuor, rarius duo tantum, filiformia, crassa, 0·025–0·035 millim. longa et

initio subfasciculata ex apice agunt; simul præterea in partes totidem coadunatas ipsa longitrorsum vulgo dividuntur. Sporæ ovato-oblongæ et nonnihil reniformes plasma granosum et lacunam vel guttam ocelliformem mediam fovent, quæ, ubi deciderint, in germen crassum, loco temporeque faventibus, protrahuntur, unde etiam, si brevius constiterit, spora nova s. sporidium enascitur.

Haud infrequens provenit, jove pluvio, in udis et opacis sylvarum, secus ambulacra quidem et fossas, sera æstate autumnoque, et in agro Cadvillensi Versaliorum jampridem quotannis nobis occurrit.

Hyphæ quibus tela fungina constat ubique similique modo tenuissimæ sunt, ramosæ et parcissime septiferæ; earumdem brachia in strato fertili peculiariter crebra et contorto-intricata reperiuntur; ubi brachium quodcunque ibidem in basidium desinit, plerumque surculum seu brachium alterum sub basidio ipso agere satagit.

Cl. Fuckelius, loco sup. citato, candide fatetur se sporas *Thelephoræ sebaceæ* nondum vidisse; fungus enim sæpissime totus sterilis aut parcissime sporophorus invenitur.

2. SEBACINA CÆSIA *nob.* = Corticium cæsium *Pers. Obs. Myc.* parte i. p. 15, tab. iii. fig. 6 (saltem ut videtur).=Thelephora cæsia *ejusd. in sua Synopsi Meth. Fung. et Myc. Europ.*=Thelephora (Phyllacteria) cæsia *Fr. Syst. Myc.* t. i. p. 449. Fere tota byssina est et coloris cinereo-cæsii, arenæ inter muscos repens hæret, ac passim etiam in pulvinulos obtusos et deformes incrassata prominet; cæterum de basidiorum (quæ bipartita vel quadripartita item deprehenduntur) forma et crassitudine *Sebacinam incrustantem* prorsus imitatur; sporæ paulo minores et contractiores pleræque videntur.

Nascitur in sylvis arenosis et umbrosis Octobrique (anno 1861) Fontebellaqueo (loco dicto *Butte à Guay*) nobis primum obvia est.

Utrum fungillus noster admodum ipse sit atque Persoonianus modo citatus, necne, ægre decernendum est, licet ejusdem omnino naturæ videatur. Habitu saltem et structura fertili præcedenti plane congener est.

Merisma fastidiosum Pers. ad *Sebacinas* jure spectare, ob solitum et fastidibilem habitum, libenter suspicamur; quod quidem vivum olim, nec semel, Cavillæ et Modoni agri Versaliensis vagantes reperimus, minime autem attentis oculis et vitrorum ope scrutatos fuisse recordamur. Quasi grandis *Sebacinæ incrustantis*, forma, ni nos fallit memoria, omnino videtur.

V. Those who have observed the fertile apparatus or *hymenium* of the *Auriculariæ*, must have noticed the similarity of the linear multipartite basidia which compose it, to the sporidiophorous *promycelium* of the *Pucciniæ* and *Podisomata.* These basidia call to mind the sporophorous threads of our *Hypochnus*

purpureus (in Ann. des Sc. Nat. 5th ser. t. iv. [1865], p. 295), except that these threads are bent in the shape of a crosier, instead of being rectilinear and upright. If we consider the byssoid nature and effuse or indeterminate form of that *Hypochnus*, by which characters it comes near to the *Sebacinæ* above mentioned, it will, perhaps, appear to stand in the same relation to the *Auriculariæ* as these pretended *Thelephoræ* to the true *Tremellæ*.

As one analogy often leads to another, we may remark that the fertile crosiers of *Hypochnus purpureus* would be like those of *Ptychogaster albus* Cord., and of *Pilacre* Fr., if their spores were not borne upon such long pedicels.

In order to enable the reader to make this comparison, we should have had much pleasure in adding to this text the analytical drawings we made, some years ago, of the two genera of *Gasteromycetes* and of the *Hypochnus* just mentioned *; but these drawings are now, alas! in the hands of our enemies the Prussian soldiers, and perhaps already destroyed or burnt.

VI. The hymenial structure of the *Tremellæ* and their analogues is moreover complicated by the habitual presence of a spermatophorous apparatus, the elements of which are sometimes mixed with those of the sporophorous hymenium, at other times, on the contrary, separately congregated on certain spots of the surface of the fungus. This duplicate arrangement may be met with in the same individual, as was observed by us in *Tremella mesenterica* Retz. The spermatia of this species are little corpuscles, spherical and innumerable. Those of *Exidia spiculosa* Sommerf., and of *Dacryomyces deliquescens* Dub., are rather ovoid, and their presence is often not easy to verify.

Since our first investigations, we have found a splendid spermatophorous apparatus in a rosy *Tremella* which grows on the dead trunks ot Cherry-trees. Here the spermatophorous spots are orbicular, concave, and marginate, so that they resemble the cups of grouped *Pezizæ* placed on the inferior lobes of the plant. The spermatia themselves are cylindrical, bent in the shape of a bow, and, united three or four together, they form little groups or capitules on the slightly enlarged tops of the fertile threads. This fungus is sufficiently interesting to deserve a description.

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* With regard to the same fungi, see what we have formerly written in the Annales des Sc. Nat. 5th sér. t. iv. (1865), pp. 290–296.

TREMELLA CERASI *Schum.* Mollis, lævis, dilute rosea, pulvinulis diffusis, valde repandis et corrugatis, pollices 1–2 crassis, sæpeque in imo ambitu sparsim vel congestim mirum in modum foveolatis, foveolis autem seu urceolis orbicularibus vel oblongis et inæqualibus, velo fugaci limboque seu margine incrassato ac saturatius fucato donatis, in disco contra abunde spermatiophoro dilutius purpurascentibus; basidiis in omni fungi pariete, præter foveolas spermatiophoras, confertim solitoque ordine instructis, globosis aut nonnihil ovatis, 0·01–0·013 millim. crassis, sterigmata filiformia quatuor de more ex apice enitentibus; sporis oblongis, curvulis 0·01–0·02 millim. longis et 0·005–0·01 millim. crassis; spermatiis cylindricis, lunulatis, utrinque obtusis, 0·006–0·01 millim. longitudine æquantibus, nec 0·002 millim. crassioribus, in summis hyphis vix incrassatis congestim insistentibus, nec nisi in urceolis supra dictis generatis.

Oritur in cortice putrescente *Cerasi vulgaris*, autumno, nobisque jampridem occurrit in agro Lugdunensi, prope pagum dictum *Pomey*, haud procul a castello *S. Symphorien-sur-Coise*, Octobri ineunte (A.D. 1855).

Fungus e corticeæ matricis fissuris erumpit et liber expanditur. Modo dicti urceoli, omni attentione digni, discos fertiles *Urceolariæ scruposæ*, e lichenum gente, habitu quodammodo mentiuntur; nunc fungi parieti plano sessiles imponuntur, nunc contra prominent; quocumque autem modo se habeant, margine incrassato definiuntur, initioque velo purpurascente tenui et continuo obducuntur; id veli postea medio dirumpitur ejusque residua in margine, propterea quasi limbato, aliquantulum persistunt. Hyphæ spermatiophoræ, tenues et subdichotome ramosæ, in corymbos densos abire videntur quorum extrema brachia, brevissima ac vix ac ne vix capitata, denso spermatiorum fasciculo singula coronantur. Spermatia mire exigua sæpius quaternatim coadunantur; nonnulla tamen, ni fallimur, sparsim solitaria deprehenduntur quæ sic dictarum *Tuberculariarum* conidia de origine æmulantur. Spermatia cæterum omnia, sporis longe minora et multo magis incurvata, quum origine, tum forma et exiguitate, ab iisdem sine negotio discriminantur. Germina quælibet ex his spermatiis exire nunquam vidimus. Sporæ, e basidiis rite enatæ, plane genuinæ seu Tremellineæ sunt, itemque, quum germinaverint, sporas secundarias aliquando enituntur.

VII. As we are now recapitulating briefly all the kinds of organs that may be available for the reproduction of Tremellineous fungi, we cannot forget that one of them, *Dacryomyces deliquescens* Dub., sometimes resolves itself into a multitude of *gemmæ* or *conidia*, and that the specimens in which this occurs are at once recognized by an attentive observer from their peculiar appearance; and if any one should be inclined to think that

those singular specimens might belong to a different type, he would give up his conjecture on seeing the conidiophorous nature and the typical or sporophorous structure sometimes united in the same subject (see the Ann. des Sc. Nat. 3rd ser. t. xix. pp. 216–219, pl. xiii.).

If we are not mistaken, we must consider very analogous to conidiophorous *Dacryomyces* a Tremellineous production that grows on the bark of the dead branches of *Salix capræa.* It appears also under the shape of little pulvinules, globose or irregular, scarcely as large as the seeds of the sweet pea, and of a red carmine colour. The whole mass of these pulpous corpuscles is composed of ovoid, smooth, transparent cells soldered to each other by the ends, forming ramified *monilia*, and recalling to memory the *Hormiscia* and other well-known ferments. Such cells or conidia separate from one another very easily.

We have only once found this fungus, in the damp woods of Chaville, near Versailles, in January 1865; we will here give a short technical description of it.

> DACRYOMYCES PURPUREUS †, pulvinulis exiguis, purpureis, erumpentibus, paucis gregariis, imo solitariis, primum compressis et acutis seu cristatis, postea autem deformibus et jove pluvio collabentibus, natura pulposis totisque fere e conidiis seu cellulis ovatis, levibus, simplicibus ac primum catenatis, catenis vero seu monilibus abunde ramosis.
>
> Nascitur, hiberno tempore, ex emortuo fissoque cortice *Salicis capreæ* et nobis semel hactenus obvius est in sylva umbrosa Cadvillæ ad Versalias, anno S. 1865, mense Januario ineunte.

Nuperrimo tempore eundem fungillum, ni nos omnia fallunt, iterum reperimus, nec quidem infrequentem, in asseribus pineis jamdiu sub dio degentibus, apud Venetos Armoricæ australis, Novembri mense (1870).

VIII. Besides the characters before mentioned, the spores of the Tremellineous fungi have the power of sending forth, in germination, either simple threads or secondary spores (sporidia). These are sometimes solitary, and resemble the mother spores except in being slightly smaller; sometimes they are much smaller, of a peculiar shape, and very numerous, like those which occur in various *Discomycetes*, such as *Pezizæ*, *Bulgariæ*, *Dothideæ*, &c. (See our Selecta Fung. Carpol. t. 2 & 3.)

IX. The Tremellineous fungi being so abundantly provided with reproductive bodies of various kinds (being in fact in this respect more richly furnished than all the other families of *Basidiomycetes*), it is difficult to understand why they have been placed among the *fungi imperfecti*—that is, amongst the fungi of which the reproductive cycle is incomplete, or, in other words, of which the most perfect fertile form is still unknown. M. Fuckel, indeed, says that the indisputable connexion between some of the Tremellineous fungi and the *Ascomycetes* leads to a suspicion as to the autonomy of the remainder *. This reasoning would be specious if the matter in question were true Tremellineous plants; but although, for instance, the *Coryne sarcoides* assumes, under one of its forms, the appearance of a *Tremella*, and therefore has been, for a long while, considered a legitimate *Tremella*, it by no means follows that all the Tremellineous fungi are to be assimilated to this production, which has been so long doubtful. If the organization of the gemmiparous or spermatophorous *Coryne sarcoides* be compared with that of *Tremella mesenterica* and its congeners, it will certainly be impossible to deny various similarities; but we may justly refuse to admit a real analogy until one or other, at least, of the two following circumstances has been positively observed, viz. the existence in *Coryne sarcoides* of a system of bisporous or tetrasporous *basidia*, like that of the *Fungi tremellinei*, or the presence in *Tremella mesenterica*, or in any other true *Tremella*, of ascophorous disks, such as the cups of the *Pezizæ*, and especially of *Peziza sarcoides*. So long as nothing of this kind has been seen, it is better to consider the *Tremellæ* and their analogues to be complete or perfect fungi, and as well known, at least, as the Agaricineous or any group whatever of *Basidiomycetes*.

X. Before we bring these notes to a close, it will be, perhaps, expedient to mention a fungus thoroughly Tremellineous in its consistency, but which, by its ramified shape and fructification, seems to be completely separated from the legitimate *Tremellæ*. We mean *Ceratium hydnoides*, an almost ephemeral production which is well known to all mycologists, although hitherto no incontestable affinities have been found for it. Its small branches, simple or ramified, seem to be destroyed and to disappear at the least touch, and they are all bristling with little monosporous spicules: its organization reminds one almost exactly of *Rhopalomyces* Berk.; and as these spicules are probably merely a secondary apparatus of fructification of fungi of higher order, may we not suppose

* See Fuckel, Symb. Mycol. pp. 4, 5, 10, 402, 403. *et passim.*

that the same is the case with the *Ceratium*? We have, however, at present, nothing more to put forward by way of argument in support of this hypothesis. The ovoid spores of the *Ceratium* increase very much in size, and become nearly spherical in germination; the germs themselves are thick, very obtuse, and send out little branches very rapidly.

Kerleano near Auray (Morbihan), December 1870.

Notes on a Species of *Disperis* found on the Kagaberg, South Africa. By J. P. MANSEL WEALE, B.A. Oxon. (Communicated by C. DARWIN, Esq., F.R. & L.SS.)*

[Read November 3, 1870.]

THIS pretty little white and green flower is found in boggy places at the mouths of springs on the Kagaberg, in the months of February and March. As far as I am aware, no descriptions have been as yet published of the mode of fertilization of either the genus *Disperis* or *Corycium*; and as their structure offers many peculiarities strikingly divergent from the better-known genera of Orchideæ, I shall endeavour to describe the curious contrivances exhibited in this plant.

Each spike contains from 1 to 8 blossoms. The back sepal is adnate to the petals, and forms a very inflated dome-like galea having a very distinct keel-like crest. The two petals spread outwardly about halfway from their base, and are marked with green glandular ridges. They then lap forwards and taper upwards to a point like the opening to a tent. The two lateral sepals have each a short nectary about the centre of the blade, in front of, and at each side of the column.

The column forms, with the adnate labellum, a broad fluted pillar surmounted by a cup, whose long lip tapers upwards between the adhering apices of the two petals. On each side of the labellum project the two step-like processes of the rostellum considerably in front of the face of the flower.

Having thus described the general aspect of the flower, a more minute account of its separate parts will be requisite for a complete understanding of its structure and the adaptation of its parts. Viewed laterally, the labellum presents in its front part a deep cup, the lip of which curves upwards at almost a right angle to the posterior portion, in such a manner that no insect could possibly reach its interior from the front—a difficulty which is increased by the outspread edges of the middle portion of the petals. Behind, the two sides of the cup rise backwards to a level with the top of the lip, and then spread behind and over the anther in an elongated somewhat oval appendage. On each side of the centre of the labellum two large membranous shield-like expansions, convex anteriorly and concave posteriorly, spread out and completely envelope the pollinia. The two narrow transverse divaricate stigmas, close to, immediately behind and on each side of the cup of the labellum, lie on the fleshy base of these expansions, while immediately in front of them project the legs of the step-like rostellar processes.

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* [This and the three following papers by Mr. Weale were accompanied by drawings, which remain in the keeping of the Society, and which may be consulted by any one who may wish to make a special study of the subjects referred to.—SEC. L.S.]

I will describe the relative situation of the anther and rostellum, on the supposition that the face of the flower is placed vertically—a position, however, which it does not assume in nature. The two steps of the rostellum would then lie in a plane parallel to the face of the flower, and nearly at right angles to the legs. The legs, again, would be placed at right angles to the pollen-masses; and as the long slender caudicle follows the direction of the leg-like processes, it is evident that in its natural position it is doubly bent, somewhat like a reversed S or a Z. The foot or step of the rostellum is broad in front and tapers behind, somewhat like an isosceles triangle with rounded angles. The membranous edges curve slightly inwards, and resemble a lady's stirrup with very broad toes.

Each is curved slightly outwards; and the edges of its membrane are also curled in, to retain the caudicle in its place. The viscid disk is an elongated thin membrane of nearly the same shape as the stirrup or step, and viscid on its upper surface; the caudicle arises from its narrow inner edge.

I examined this flower for some time before I could make out how it could possibly be fertilized by an insect; and the difficulty was increased by my holding the flower vertically as above described. In nature the flower is bent down in a nearly horizontal position; the blades of the two sepals extend, on the contrary, in nearly opposite planes.

Let us suppose an insect to visit these flowers, as is proved by the fact of their producing numerous fertile capsules. It would most probably alight on the lateral sepals and suck some nectar from their little nectaries. It would then probably try to reach the cup-like labellum in the interior of the flower, in order to drink the more copious supply of nectar which lies in the cup.

If it crawled up towards the base of the sepals, it would probably, unless very small, find no footing on the narrow blade, nor could it enter the galea at this point, as the petals, as before stated, taper away to their junction with the broad fluted column and labellum which fill up the whole of the centre of the galea.

The stirrup-like processes of the rostellum, however, stand out; and their broad feet would form a convenient landing-place especially suitable for a small Hymenopter or Dipter. In trying to enter thence the two chambers which open on either side of the labellum, its feet would stick to the viscid disk, and the long elastic caudicle would prevent its forward progress. In trying to rid itself of the incumbrance it would doubless withdraw the pollinium or pollinia; and were it again to attempt an entrance, their projecting faces would strike against the column and prevent ingress. Under these circumstances the insect would probably fly away to another flower, and whilst doing so, the pollinia would assume another position. In about a minute after removal the caudicle bends backwards, so that the pollen-mass lies above and behind the front part of the long viscid disk. Were the insect to alight then on a plant whose pollinia had already been withdrawn, it could easily enter the lateral chambers already mentioned, and could thence reach the nectar through the hollowed sides of the cup. In turning round to do this, the pollen-grains would almost certainly become attached to the stigma; or, as they adhere together but slightly, some would be knocked off against the dome, and would almost certainly fall on the stigma.

I tried to fertilize this plant artificially by inserting a needle; but it was only by a good deal of awkward twisting that its fertilization could thus be effected; and the utility of the movement of the caudicle was not apparent, as it was almost as easy to do it before the contraction had taken place. At the same time it was evident that no insect of considerable size could enter the side chamber; and I presume the fertilization is effected by some of the small bees or beetles which frequent flowers.

The position of the two viscid disks (which are so prominently situated, and which have their upper surface viscid, instead of the under surface as is usually the case in Orchids) shows plainly their office as steps to the forum of the galeatic chamber, one to each receptacle.

This is the only instance that I know of amongst Orchideæ in which the adaptation suggests that the tarsi of insects are the agents of fertilization, although in Asclepiads this would appear to be in some instances the normal method.

Some Observations on the Fertilization of *Disa macrantha*. By By J. P. MANSEL WEALE, B.A. Oxon. (Communicated by C. DARWIN, Esq., F.R. & L.SS.)

[Read November 23, 1870.]

THE diminution in size and simplicity of structure of the labellum in some species of the genus *Disa* would seem to indicate its little service as an attractor of insects and as a necessary appendage to the fertilization of the flowers, its office being replaced by the large and often gaily-coloured posterior sepal.

In the adjoining genus *Brownleea*, this reduction is so considerable, that it may be said to be in a merely rudimentary condition, and to have altogether lost the important function it usually holds in the order. Compared with some species of *Disa*, it is comparatively large in *D. macrantha*; certainly it is in relative proportions to *D. grandiflora*.

The back spurred sepal is, on the other hand, proportionally large.

The two lateral sepals, the petals, and labellum spread outwardly from the column, so as to form a salver-like opening to the funnel-shaped posterior sepal.

The colour of the blossom varies much, from nearly pure white with a few pale mauve spots on the petals and labellum, to a bright rich purple; sometimes the spots are small and indistinct, sometimes in large blotches, scarlet and almost orange.

It emits, especially towards night, an overpowering, heavy perfume, almost too strong to be agreeable.

In the normal position of the open flower the anther lies back, behind and above the stigma, nearly at right angles to the stigmatic surface. The caudicles rise upwards and forwards from the anther-case to their junction with the viscid disks. These are placed parallel to each other in the clefts of the lofty turret-like rostellum perpendicularly to, a little behind, and considerably above the stigma.

The disks are exceedingly viscid, and take some time to harden. On withdrawal the large heavy pollinium hangs down by its own weight, and freely dangles in the air, suspended by the long and flexible caudicle.

The plants generally grow in open gullies at the base of the "Kagaberg." I have, however, met with them on the mountain itself. They are generally surrounded by high grasses and herbaceous plants, and seem to prefer moderately sheltered and moist situations.

Nothing can be simpler than the fertilization of the flower. The brilliant colouring, the heavy perfume, the conspicuous size of the plant and flowers, are sufficient to attract both by day and night flying insects; and although I have never detected any in the act of fertilizing, nor seen any with the pollinia attached, I feel assured it must be frequently visited.

The plants bear abundance of seed—in which respect they differ from *Disa cornuta*, so far as my observations go, and from *Disa grandiflora*, according to Mr. Trimen (*vide* Journ. Linn. Soc. vol. vii. no. 27, p. 144).

There is one point, however, to which I would wish to draw attention, viz. *to the frequency of self-fertilization* in this species.

A very slight jerk, when the flower is fully expanded, suffices to eject the pollinia from their widely open anther-cases, and to bring them into contact with the stigma. This in nature is not unseldom the case, as I have repeatedly found many flowers thus fertilized. I am inclined also to think that an insect withdrawing the pollinia, attached as they must be to the lower portion of its body, would probably also fertilize the same flower.

The anther in this species is supine; in *D. cornuta* it lies still further back; but in *D. grandiflora* it assumes a position slightly more erect.

In the bud the anther is nearly quite erect, and the rostellum projects right in front of and over the stigma.

Both *D. grandiflora* and *cornuta* are comparatively sterile, although apparently so well adapted for being fertilized by insects; yet in this species, where self-fertilization cannot be rare, the flowers produce an abundance of seed. Were the anther erect, as in the bud, or still more supine, as in *D. cornuta*, self-fertilization would be impossible, and other contrivances for fertilization would be necessary. This is the case in *D. cornuta*, where the pollinium undergoes an upward movement after removal.

I mention these circumstances with the view of seeing them worked out in other species.

At present it seems strange that out of three very conspicuous species the most fertile should be one frequently liable to self-impregnation.

Mr. Trimen, in the paper referred to, has aptly observed that *Disa grandiflora* seems to be a correlative case to that of *Ophrys muscifera*: it is curious that we should find the parallel carried out in *Disa macrantha*, an instance almost corresponding to *Ophrys apifera*, in which self-fertilization would appear to be the rule instead of the exception, and whose fertility is considerably greater than that of *O. muscifera*.

Notes on some Species of *Habenaria* found in South Africa. Abstract of a paper by J. P. Mansel Weale, B.A. Oxon. (Communicated by Charles Darwin, Esq., F.R. & L.SS.)

[Read November 3, 1870.]

In a species of *Habenaria* found in December 1869 and January 1870 on my farm "Brooklyn," nine miles from King William's Town, the contraction of the caudicle takes place principally at the end attached to the viscid disk, which is seen to be very much thicker than the portion attached to the pollinium when removed from the rostellum. So great is the tension when *in situ* that it is surprising the pollinia are not often dragged from the anther, or the disk from the rostellum.

The fertilization of the plant is simple in the extreme, as any insect settling on the bridge must almost certainly deposit one or both of the pollen-masses on the stigmata.

The plant does not appear to be visited by diurnal insects, but must be very attractive to nocturnal ones, as, although each spike bears many flowers, and the plant itself grows in considerable abundance on the open grassy flats, almost every flower that I have examined has been fertilized.

In another species of *Habenaria* found on the Kagaberg, in February 1869, and on my farm "Brooklyn" in February and March 1869, the whole caudicle, when *in situ*, is relatively much shorter than in any of the preceding species, and does not contract on withdrawal, but is nearly rigid. The viscid disk is seen to be oval on its outside, with a slight extension laterally.

The caudicle at its juncture with the disk is somewhat triangular, the outer angle joining the projecting portion of the disk. This triangular appearance is produced by its being folded over on itself, something like a T-hinge; at the same time, as if this fold had not produced a sufficient shortening of the caudicle, a thin tail-like portion projects beyond.

I was, at the time when I first examined it, inclined to think that the thickened fold was the homologue of the drum-like pedicel of *H. chlorantha* mentioned by Mr. Darwin; but the structure under the microscope appeared to indicate that it is really a thickened portion of the caudicle corresponding to the discal extremities of the caudicle in the two former species.

I watched very carefully to see whether any movement took place on removal, and was at first inclined to think so: but on more careful examination I found that I was mistaken; in fact the incurved portion of the pollen-masses is quite sufficient to place them in a proper position for the fertilization of the flower. I found considerable difficulty in removing the viscid disk, although its prominent position seemed to offer as great facilities as in the other species; and the constant fertilization of the flowers throughout a whole spike leads me to suspect that my pin had too smooth a surface for the viscid disk to adhere to.

Observations on the Mode in which certain Species of Asclepiadeæ are fertilized. Abstract of a paper by J. P. Mansel Weale, B.A. Oxon. (Communicated by Charles Darwin, Esq., F.R. & L.SS.)

[Read November 3, 1870.]

On placing the blossoms of *Gomphocarpus physocarpus* in water, I noticed that numbers of flies, attracted by the sweet nectar contained in the cucullate folioles, got attached to the stigmatic glands and appeared unable to release themselves.

On allowing the flowers to remain until completely withered, I ascertained that the flies had not sufficient strength to extricate themselves and eventually perished with the flowers.

That other insects also frequented the flowers to their own detriment was abundantly visible from the remains of legs, belonging to small moths and other insects, detached and adhering to the stigmatic glands.

After leaving Port Elizabeth my researches were for some time abandoned, and were resumed partly at the Koonap and partly at Bedford. At the latter place I found that the same insects frequented *G. physocarpus*, with the important addition of several large wasps.

It was here that I first observed that the pollen-masses were inserted in the fissures of the anthers; but in most instances they seemed to have been pushed down instead of being regularly inserted after withdrawal.

In two other species of *Gomphocarpus* common at Bedford I found the pollen-masses removed, and in some instances inserted, and I also captured several species of winged Hymenoptera with pollen-masses attached to their tarsi.

Besides these, I may mention a beetle belonging to the genus *Lycus*, some moths, and *Pyrameis cardui.*

At Ettrick I observed some plants of *Gomphocarpus fructicosus* and *G. physocarpus*, the first a true denizen of the Karroo, the latter confined to the grass-country, which two kinds of soil join hereabouts.

Both plants were visited by large Hymenoptera; and their flowers and pollen-masses resemble each other very closely in structure. I gathered in the neighbourhood specimens which appeared to partake of the characteristics of both plants in a modified degree, such as the distribution of tomentum, the colouring of the foliage and flowers, and the shape of the follicles. I regret to state that, owing to several days' incessant rain, these specimens were destroyed by mould during desiccation, yet I am almost convinced that they partook of a hybrid nature, and am inclined to think that, under favourable circumstances, they may be fertile and be established as permanent varieties.

Later observations have tended to confirm this opinion; for it is

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not uncommon for plants of most dissimilar genera in this Order to become fertilized by alien pollen, although in such instances the fruit is not matured.

? *Xyomalobium linguæforme* ? Harv. MSS.

This plant grows abundantly near my house, and flowers from November to January. The calyx is small. The corolla is large, and the segments curve upwards over the edge of the large stigma. The segments are parted nearly to their base, so that there are large openings between them. Each segment is directly opposite the fissure of the anthers, so as to prevent access from the sides of the flower. The folioles are 3-lobed and fleshy. The lobes are stout and pointed; they curve outwards and inwards, like the corolla. The central lobe is the longest, and stands up on one side of the stigmatic gland between each anther. The smaller lobes of each foliole point upwards beneath each stigmatic gland. The bases of the folioles within secrete a sweet juice very attractive to Hymenoptera.

The stigma is large and flat, and stands high up in the flower, so that the alæ of the anthers project forwards between the central lobes of the folioles. The lobes are very convex and widely open at their base.

It will thus be easily understood that while access to the stigmatic glands and fissures of the anthers is extremely difficult from the sides, from above the flower the same is tolerably easy, as the long central lobes of the folioles stand up between each gland, while a pair of the smaller lobes of two folioles meet immediately below the rounded projecting alæ of the anthers.

The folioles and stigma are pale yellowish green, nearly white, with a few brownish markings; and the corolla is green. The flowers are consequently inconspicuous although of moderate size. They have no scent, and do not secrete a large quantity of nectar at a time, although I imagine the flower continues its secretion for a long time until fertilized.

This species is constantly visited by a large black-and-yellow wasp, which, from the neuration of the wings, belongs apparently to De St.-Fargeau's genus *Pallosoma*, one of the *Pepsidæ*.

I have observed as many as six of these insects on one plant busily sucking the drops of nectar from the base of the tongue-shaped folioles. When thus engaged, they are exceedingly restless and active, straddling with their long legs across the flower and pushing their proboscides eagerly into the flower. While thus scrambling over an umbel of flowers many of the pollen-masses are extracted, by the claws of their tarsi catching in the notched stigmatic glands.

In the prime of their flowering most of the plants have their masses withdrawn before withering, and sometimes as many as two pollen-masses inserted in one fissure, although it is seldom that pollen-masses are inserted between all the alæ of one flower.

The stigmatic glands* and arms to which each pair of pollinia are attached are edged by a delicate pale yellowish transparent membrane, which I am inclined to think is viscidulous.

The stigmatic gland is deeply furrowed in the centre, narrow at the apex, and widely open towards the base. The arms, which are rather short, are bent upwards at their junction with the gland, then again downwards in a rather deep curve, and again upwards. The edging membrane is carried beyond to the point where the pollen-mass is attached. The pollen-masses themselves are somewhat truncated and quadrate.

In the following descriptions the margins of each pollen-mass will be named in reference to their position in the anther-cells; viz. that which faces the inner extremity of the cell will be called the *inner margin*, and that facing the fissure of the alæ the *outer margin*.

From the above description it is evident that if an insect, while scrambling over the plant, inserted the claws of its tarsus or any other hooked portion of its body, such as its mandibles &c., beneath the gland, or if the claw got inserted towards the base and was then drawn upwards in the contracting channel of the gland, it would become firmly attached and easily withdraw the pollen-masses.

Although the pollen-masses are often withdrawn by the tarsi of insects belonging to the Coleoptera, Hymenoptera, Hemiptera, and Lepidoptera, I am much disposed to doubt whether in most instances this mode would ensure the replacement of the gland in the fissures formed by the alæ of the anthers.

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* In the description of the stigmatic gland and arms the latter are described relatively to the gland, and not to their position in the anther-case. Thus when they are spoken of as extending outward, it is in reference to the position of the gland, and not to the anther-case. I mention this in order to render the description plainer, the margins of the pollen-masses themselves being spoken of in an inverse manner.

On the wasp already mentioned I have found pollen-masses attached to the tarsi, to the long hairs of the sternum and coxæ, and to the spines of the leg; but I have never found more than a single pair thus attached, and have never found glands separated from their masses.

On the other hand, it is by no means uncommon to find several combinations of the glands attached to the unremoved pollen-masses, as also to those inserted in the fissures of the antheræ. I once found and figured a portion of the head of an insect attached to a pollen-mass, but I unfortunately lost it in removing it from the pollen-mass to which it was fixed. I have twice observed these wasps with several pollen-masses attached to some portion of the head, but failed in capturing the specimens. I noted this especially as occurring on the 23rd of January of this year, when I observed numbers of these wasps frequenting the plants. I am myself thoroughly convinced of the correctness of this view, as without it there can be no explanation of the structure of these plants. I have repeatedly watched wasps with the pollen-masses attached to their tarsi; and although they have visited many flowers, I have in no instance seen the masses inserted, although it is not uncommon to see them thus withdrawn. Although numbers of pairs of pollinia are withdrawn, very few in comparison are inserted.

I have already stated that in *Gomphocarpus fruticosus* the pollen-masses close together inwardly on withdrawal, so as to clasp tightly the leg of the insect.

In this species there is a similar movement, only in a slighter degree. The arms bend inwardly, so that the two pollen-masses are nearly parallel, but somewhat apart from each other.

I have not ascertained the structure which produces these and other movements in the pollen-masses of Asclepiads, as, owing to their diminutive size, they require close and careful examination, for which I have not had sufficient leisure.

It is a curious matter for observation that in some Asclepiads this movement never takes place, in some only slightly, while in others, as in *Periglossum* and *Aspidoglossum*, the movement takes place in an entirely different direction.

In this species I have found most curious combinations of the pollen-masses. I have seen five glands attached together, in the first of which an arm was still inserted, showing that the combination was originally greater. From these, four pollen-masses had been detached, eight still remaining attached to the glands.

In another instance four glands were attached together, from which six pollen-masses had been removed, two only remaining attached to the unremoved gland. In this case also an arm was left disruptured in the upper gland, showing that the combination had been formerly larger.

Towards the close of their flowering-season a careful examination of these plants would probably result in many more curious combinations.

As an illustration of the probable correctness of this species not being fertilized by the tarsi, I have never met with a gland attached by itself to the tarsus; yet in most cases the presence of a disruptured arm would show that one gland at least remains attached.

When the *Pallosoma* visits these flowers, as I have frequently observed, it plunges its head in between the middle lobes of the folioles to their base, busily sucking the nectar; but in so doing the smaller lobes, projecting upwards, interfere with it in some measure, and, as I have noticed, caused considerable annoyance to the insect. To this and the exciting influence of the nectar I, in some measure, attribute its restlessness; although it is, apart from these, an active and watchful insect. I have also noticed that it sometimes sucks round the gland itself; and as Robert Brown states that the gland, in the species which he examined, continues to secrete after the opening of the flower, I am disposed to think that this secretion may be of essential service to the flower in attracting the wasps when the more abundant store of nectar at the base of the folioles is exhausted.

It is probable, too, that the adherence of so bulky an object as any of the combinations already mentioned to any part of the head would cause much discomfort to so agile an insect, to release itself from which the fissures of the anthers offer a ready means.

The attentions of this insect are paid to several other Asclepiads, such as *Periglossum*, as also to a *Cissus* and a *Eucomis*. These flowers are, most of them, dull-coloured and of very different size, but afford, apparently, a quality of nectar peculiarly pleasing to this wasp; for there were in blossom at the same time Asclepiads quite as conspicuous and more so than *Periglossum*, affording, too, an abundance of nectar, but which I have never seen it visit, although they appeared attractive to some other Hymenoptera.

Lastly I have to advert to the singular fact of the pollinia of other Asclepiads being often inserted in different species—a fact the more strange, as in *Periglossum* I have always found the *exterior pellucid margin* of the pollen-mass inserted instead of the inner, as in most other Asclepiads; and it is on this margin that the rupture and protrusion of the pollen-cells takes place, which is the normal mode of fertilization in this plant.

I have on many occasions found the pollen-masses of *Periglossum* inserted in the fissures of the anthers of this species; and not merely are they inserted, but the masses are disrupted and give out tubes which appear to penetrate the ovarium of the flower.

This noticeable fact, combined with my remarks on *Gomphocarpus fruticosus* and *G. physocarpus* lead me to suspect that such accidents may occasionally lead to results of which we are at present but faintly aware, but to elucidate which a series of repeated and careful experiments would be requisite.

In the first plant, out of 6 flowers open, 4 had pollen-masses inserted, and 2 had 4 pairs of pollen-masses extracted. If it be reckoned that each flower has 5 pairs of pollen-masses and 5 fissures, it will be seen that this plant has very few withdrawn, —much fewer than is usual, so far as my observations go.

Thus 6 × 5 = 30 pairs pollen-masses,
4 ,, withdrawn,
—
26 ,, *in situ*,

6 × 5 = 30 fissures,
6 with masses inserted,
—
24 unfertilized.

In the second plant, not reckoning that destroyed by insects, out of 8 flowers, 7 had pollen-masses inserted, and one had foreign pollen inserted, and 7 had 19 pairs of pollen-masses extracted.

Thus, not reckoning the foreign pollen,

8 × 5 = 40 pairs pollen-masses,
19 5 withdrawn,
—
21 ,, *in situ*,

$8 \times 5 = 40$ fissures,
16 with masses inserted,
—
24 unfertilized.

As I have collected seed of this and other Asclepiads, I hope next year to supply the Society with some statistics more satisfactory than those inserted in this paper.

Pachycarpus.

This plant, which is almost as abundant on my farm as the last, produces many and larger flowers, but very seldom fruit, and then generally only one follicle on a plant. The corolla is brown, and widely open. The folioles are horizontal and expanded, as in the genus generally, and contain a good deal of nectar in the furrows. The stigma does not project as in the last species. The alæ of the anthers project outwards, are widely open, and acute at the base, where they turn slightly upwards. The pairs of pollinia are widely expanded and the masses oblong. The stigmatic gland is large and channelled, very narrow in the centre, and broadly open at the apex and base. The arms are curved downwards, and outwards, upwards, and downwards, at their junction with the masses. Where they join the gland there are two small expansions of membrane, and the arms themselves are slightly edged with membrane. On removal the arms and masses are never inflexed, but remain as rigid as when in the anthers. I have only very seldom found masses inserted in the fissures, although I have examined many plants on different occasions.

Periglossum.

The flowers of this plant are arranged in dense umbels, and are greenish and very inconspicuous. The plant itself has much the aspect of a *Carex*, and grows among rank herbage by the banks of streams. The corolla is not very widely open. The folioles adhere closely to the stigma, are broad above, and rounded, somewhat like a half moon, with the horns bent downwards like hooks.

Below the half-moon expansion the foliole is much contracted.

The pollen-masses are remarkable for the minute size of their glands and the length of their arms. The arms are bent downwards, outwards, upwards, and downwards from the junction with their gland to the pollen-masses. The pollen-mass itself is very small compared with the length of the arms. The arms are expanded where the masses join. The masses bend outwards, are elongated and considerably curved. Their last third is pellucid and much attenuated. It is on this *pellucid outer* margin that the rupture and protrusion of the pollen-tubes take place. The alæ of the anthers project but little, and extend low down in the flower. They are widely open at the base, and then suddenly contract, so as to form a sort of sharp notch. The whole gynostege is closely enveloped by the folioles and corolla. On withdrawing the pollen-masses with a pin, the movement, which is very curious, can be easily seen. On lifting up the gland a short distance, it bends inwards towards the centre of the stigma, and the arms outwards and away from it. On withdrawing it entirely, the long arms bend out completely, and hang loosely from the small gland. The pollen-masses somewhat resemble the long curved-up hoofs which sheep acquire when feeding on marshy soft ground. The disruption of the pollinia generally takes place where the arms are joined to the gland, and not at the junction of the pollen-masses to the arms, as is usually the case. I have, on one occasion, seen them disrupted in this place.

I think it not improbable that the long thin dangling arms of the pollen-masses may render the fertilization of this flower somewhat difficult, and that the hooked folioles delay an insect by the long upcurved pollinia being caught in them, in which case it would push downwards in order to extricate itself, and the end of the pollen-mass would almost certainly be caught in the sharply notched fissure of the anther, and become detached. The hooked portion of the foliole is widely curved, and thus the pollen-mass would be prevented from becoming detached as it does in the bootjack-like fissure.

The *Pallosoma*, already mentioned, is a very constant visitor of this plant; and had it not been for its conspicuous visitor I should have often missed a plant. I think this affords a useful hint to collectors, as many small and inconspicuous Asclepiads would otherwise have often escaped my notice.

I have never observed pollen-masses attached to the tarsi of this Wasp, nor have I on any occasion seen combinations of the glands; nor do I see how such a combination could be possible, as the arm is so attenuated at its junction with the gland that it is very easily ruptured, whereas, at the other extremity, the width of the arm is greater than that of the pollen-mass itself. The wasp, when visiting the plant, greedily sucks nectar from the base of the folioles, although it is apparently secreted in very small quantities. Like the other species already described it is destitute of scent.

Cordylogyne.

The pollen-masses are oblong and bend outwards. On removal the arms bend slightly in. Combinations take place between the glands and pollen-masses in the usual manner, viz. by the insertion of the arms in the furrows of the gland. The flowers are very extensively visited by some insects unknown to me.

This concludes my present examination of the order; but although imperfect, my observations lead me to expect great results from future investigations, and that we shall find in the other subdivisions of the order, viz. the Tribes *Periploceæ*, *Secamoreæ*, and *Stapelieæ*, as wonderful contrivances graduating into each other as in the different tribes of Orchids.

In conclusion, I would remark that sufficient evidence has been obtained to show that insects extensively fertilize these plants, and that there appears to be an adaptation between the form and movements of the pollinia, the alæ of the anthers, and the position and shape of the folioles and corolla.

The secretion of nectar, and the powerful scent, so offensive in some, so sweet in others, are probably by no means the least important functions of the plants.

As a rule these plants are dull-coloured; but there are many conspicuous exceptions among the *Stapelieæ* and others.

From the very small quantity of mature follicles produced in each plant, so disproportionate to the number of flowers, it is highly probable that these plants require to be impregnated by several pollen-masses; and when we take into consideration how many pollen-masses are removed in proportion to those inserted, it would seem that in most species nature is less economical in her adaptation of means to ends than she is in most instances. It is also a singular fact that although all the flowers have two carpels, one is almost universally abortive.

A general view of all these facts would lead to the conclusion that the adaptation of the several parts of the flower, in such Asclepiads as have been examined, is inferior in its perfection to that attained in Orchids. Perhaps some sort of compensation is obtained by the relatively large size of the seeds and the tufts of silken hair with which they are provided, by means of which they are wafted away by the slightest breeze.

Orchids are manifestly inferior in this respect. They produce, as remarked by Mr. Darwin, a prodigious quantity of fine seed which rarely germinates.

Notes on the Styles of Australian *Proteaceæ*.

By George Bentham, F.R.S., P.L.S.

[Read April 6, 1871.]

(Plates I. & II.)

In the Proteaceæ, as in the Compositæ and some other Orders, it had been observed that the anthers in most cases open and discharge their pollen upon an enclosed pubescent papillose or glutinous portion of the style, usually described as the stigma, before the flower expands; and it was therefore concluded that fecundation then and there took place. This has now long been shown to be a fallacy in the case of Compositæ; for, as Lessing and others have pointed out, the really stigmatic portion of the style is always on the inner face and often only at the base of the style-branches, which remain hermetically closed until the flower has opened and they are protruded beyond the anthers. Then, and then only, do these branches open so as to render the stigmatic surface accessible to any pollen which may be shed upon them. In the Proteaceæ the case is different; the style is undivided, the stigmatic surface is superficial even in the bud, and the contrivances to screen it more or less from the action of the pollen which is then being scattered around it, reserving it for the pollen of other flowers after it has been released from the enclosing perianth, are very various. Those which I have observed in the course of my examination of the Order for the Australian flora are chiefly the following. These observations, however, are made almost exclusively on dried specimens, as I was only able to examine a very few *Grevillea* and *Hakea* flowers in a living state, and the notes I could collect from previous observers were but very few. They will require, therefore, to be supplemented and probably in several instances corrected by those who can watch the process of ripening and mutual action of the anthers and stigma on the living plants.

As a general rule, the anthers in the bud form a close cylinder round the papillose portion of the style, which has probably some stimulating influence on them; for immediately before the opening of the flower we find the anthers open inside and the pollen-grains crowded on the style, whilst the real stigma, whether within or above or below the anther-cylinder, is as yet immature, dry, and evidently incapable of absorbing pollen. When the flower is quite ready to expand, the force which overcomes the cohesion of the valvate perianth-segments and anthers generally bursts them asunder with more or less elasticity so as to promote the scattering of the previously loosened pollen, after which the liberated style matures its stigma and becomes ready to receive any pollen that may reach it from neighbouring flowers.

The cohesion of the perianth-segments is generally stronger in their limb or antheriferous portion than in the tube, and more particularly so either at the tip or at the base of the limb at the point of insertion of the stamens, immediately under the base of the anthers. The ripe anthers, with the immature stigma buried in a mass of pollen, are thus kept in close confinement and inactivity, in some instances for a lengthened period. When the style by its growth at last succeeds in liberating itself, it is chiefly in two ways. In many of the straight regular-flowered species it will force its way straight through the end, separating the tips of the segments, which then roll back with more or less of elasticity to the base of the stamens or lower down. In many curved-flowered species the resistance opposed by the cohesion of the limb is greater, the style by its growth becomes more and more bent like a bow, breaks out through a lateral slit, and finally draws out its stigmatic end from the limb either by splitting it from the base upwards or by slightly opening it at the base only. It would appear that the extra force required by the style for this final effort is sometimes influenced by meteorological or other external conditions which may not always occur; for we often see in *Banksia* cones which have been long in flower, and have even ripened their seeds, the majority of the withered flowers with the anthers and end of the style still closely imprisoned in the closed limb. But then in those cones the majority of the ovaries have not ripened into fruits; and I believe that the perfect fruits always correspond to liberated styles; but this point requires further observation on the living plant. One thing appears certain, that there is no genus in the order where the stigma is longer kept smothered in a bed of pollen, whilst there is none where effective fecundation is proportionally more rare. In a cone of about a thousand flowers we often find not more than two or three dozen, and sometimes not one dozen, fully formed fruits.

As a good example of the style of the regular straight flower we may take that of *Petrophila longifolia* (Plate I. fig. 1), the upper portion of which is usually described as a biarticulate stigma. But, in the first place, there is no articulation; the upper portion, which may here well be called the brush, does not separate from the lower, and neither portion is stigmatic on the surface. The brush, a dense mass of short papillose hairs, corresponds exactly in length with the anthers, and collects their pollen; at the end and shut out from all contact with the pollen by the closed ends of the anthers, is the small stigmatic surface, which, besides its immaturity, is further protected by being closely applied to the inflected tips of the perianth-segments. The part played by the so-called lower article, the expanded turbinate end of the smooth part of the style, is not very clear; it probably acts as an impediment to the premature escape of the pollen through the perianth-tube, or possibly by its expansion assists in the forcing open of the segments. This distinction of the brush and turbinate base, however, is not so marked in all *Petrophilæ*; the brush is sometimes very thin and slightly papillose, tapering at the base into the slender style, the papillose portion extending always only to the base of the anthers.

In the very natural genus *Persoonia* there are three sections, showing two very different stigmatic arrangements. In *Acranthera* and *Amblyanthera* (Plate I. fig. 2) the style is straight and, as in *Petrophila*, has a papillose, furrowed, or viscid portion enclosed within the anthers, whilst the stigma protrudes beyond them, the more or less disk-shaped summit being alone stigmatic. In *Pycnostyles* (Plate I. fig. 3) the style is short and very thick, just reaching to the base of the anthers; but, in order to escape all chance of contamination from them, it curves round, turns its back upon them, and buries its small stigma in safety in a protuberance or pouch prepared for it near the base of the perianth-tube, from which it is only released by the fall of the segments with their then empty anthers. As a further security in some species the anther immediately over the pouch in which the stigma is buried is almost, or quite, without pollen.

In *Banksia* (Plate I. fig. 4) and several other genera the style, as in *Persoonia* (*Pycnostyles*), reaches only to the level of the anthers, but without any safeguard, as far as I can detect, against contamination by the pollen, except the immaturity of the stigma. In most of these flowers the perianth is much curved towards the end, the limb becomes reversed, and, opening from its upturned base, the curved style, which had already protruded laterally from the tube, becomes liberated at the end and springs upwards, shaking off the pollen it had collected whilst still enclosed with the anthers; for so much of the end of the style as reaches the anther-cylinder is generally more or less thickened and glutinous or papillose, with the small stigma at the tip entirely exposed in the bud to the collected pollen, but evidently then incapable of absorbing it. Could fertilization then take place, we should not see in so many *Banksias* the great majority of the ovaries remaining unfertilized to the last; for in the mature bud we always find the anthers open and the pollen discharged on the stigmatic end of the style.

In the majority of the curved-flowered *Grevilleæ* and *Hakeæ* the collecting end of the style is a broad thick disk with the small stigma in its centre. This broad disk may assist in spreading out the upturned base of the perianth-limb, which often remains closed at the tips, so that, when the style starts up from it, it leaves the anthers with their loose pollen in a sort of cup; and here possibly the agency of insects may be required to transfer the pollen to adjoining flowers. In *Grevillea buxifolia* (Plate I. fig. 5) and a few others there is a remarkable appendage to the back of the stigmatic disk, which is closely turned back on the style in the bud, but diverges, or even straightens, so as to form a continuation of the style beyond the lateral disk, when it has become liberated. The force by which this appendage is straightened assists probably in bursting open the perianth-limb. In some of the straight-flowered *Grevilleæ*, as in *G. vestita* for instance (Plate I. fig. 7), we have a style reminding us at first sight of that of some *Petrophilæ* or *Persooniæ* (a broad conical summit with a small stigma at the point, below it a thick columnar furrowed style resting upon an obconical smooth base), but in reality totally different. The terminal cone or disk and stigma, instead of being above the anther-cylinder and out of reach of the pollen, is enclosed within it; the furrowed style is not within the cylinder serving as pollen-collector, but below it without any apparent use; and the obconical base is not the enlarged end of the style, but the ovary at its base. Here, therefore, fecundation must have taken place in the bud were it not for the immaturity of both sexes. The globular limb opens very readily, apparently without elasticity; and at the time of its expansion I find, as far as can be judged by dried specimens, the stigmatic point still dry and small, and the cells of the anthers still almost closed and retaining all their pollen.

In *Adenanthos* the moist collecting end of the style with its stigma is enclosed in the anther-cylinder, the anthers discharge their pollen in the bud, and the limb is forced open elastically by the straightening of the long style, as in the curved-flowered *Grevilleas*; but the stigma is better protected, being contained within a slit in the style-end, which is always closed in the bud. In most species where the anthers are all equal and perfect, the style-end is terete and oblong or fusiform, with the stigma within two terminal teeth, the slit continued only a little way lower down on one side. In *A. obovata* (Plate I. fig. 8) the upper anther is barren, the style-end is oval and flat, the upper face or back opposite the barren anther is dry and smooth, the front or lower face moist and covered with pollen when the bud is ready to open; the stigmatic slit runs down the centre quite to the base, but is protected by two raised margins or lips firmly closed in the bud. When the flower opens, the very long style straightens with a jerk that shakes off the pollen from its end; and then the slit opens to receive the pollen jerked from other flowers, or perhaps brought to it by insects coming to feed on its surface.

Agastachys (Plate II. fig. 10) has a stigmatic arrangement which I do not quite understand. The flower is straight and regular, the filaments and lower slender part of the style are very short; the anther-cylinder is long and regular, all the anthers being perfect and normal, discharging their pollen in the bud, but the enclosed style-end is quite unilateral. The back or upper side is straight and smooth, plainly showing a division to about the middle into two lobes, distinct although erect and contiguous, whilst the front is a large, thick, oblong, spongy mass, showing faintly a groove or slit down the centre, at least towards the upper end. I have often found this spongy mass closely retaining small pollen-grains, but have not been able to ascertain from the dried specimens examined what part of it is really stigmatic—very possibly the inside of the slit; but of that I have no proof.

The bidentation or bifurcation of the style-end in *Adenanthos* and *Agastachys* may be one of the grounds on which some botanists have established a theory that the gynæcium of Proteaceæ is bicarpellary, as they also suppose it to be in Laurineæ; but the frequent obliquity of the stigma, the arrangement of the ovules (when several) in one double row, the obliquity or eccentricity of the ovary and ovules, and other minor circumstances have left in my mind the conviction that both are essentially monocarpellary. The division of the end of the style of each carpel occurs in many bicarpellary gynæcia, as in *Cleonia*, *Cordia*, &c. Compositæ, on the other hand, Paronychiaceæ, Amarantaceæ, and many others are examples of a really 2–3-carpellary gynæcium with a single ovule.

There are two other genera of Proteaceæ whose remarkable fecundating-apparatus requires special notice, *Conospermum* and *Synaphea*. In the majority of species in both genera the perianth bears externally a somewhat similar shape, a broad upper lobe concave over the anthers and remaining erect when the flower opens, the three other segments narrower and becoming recurved or reflexed, at least above the anthers. In both the anthers are peculiar: one in each flower has two perfect cells separated by a distinct connectivum; the two lateral ones have each one perfect cell and one barren one, usually reduced to a simple protuberance; and the fourth is quite barren. The perfect cells, instead of being at first closed and then opening by a longitudinal slit, are shaped like a hemispherical cup or bowl open on the broad face; but in the unripe bud the perfect cell of each lateral anther is closed face to face against the adjoining cell of the 2-celled anther, so that the four cells of the flower are united into two globes, which, the moment they are separated by the expanding of the flower, let fall the enclosed pollen, but not upon their own, or rather their sister stigma, which is well kept out of their way. In *Conospermum* (Plate II. fig. 11) it is the upper anther under the broad concave upper perianth-segment which has the two perfect cells; the opposite lowest anther with the lower cells of the lateral anthers are barren; the style has lengthened at an early stage far beyond the stamens, with a lateral stigma near the end which in the bud is turned towards the upper lobe; but as the flower opens, as observed by the late Dr. Graham of Edinburgh, the style is elastically bent back, presenting its stigma to the side of the barren anthers far away from the pollen-dust let loose by the separation of the perfect cells. *Synaphea* (Plate II. fig. 12) required, however, a different contrivance; for there it is the upper anther under the concave segment and the upper cells of the lateral anthers that are barren, the lower ones perfect. The style is, as in *Conospermum*, lengthened far beyond the anthers and expanded into a disk, stigmatic on its upper surface, which is bent towards the upper segment, and if elastically curved, as in *Conospermum*, would be exposed to the perfect anthers. It must be retained in its primitive position; and this is done by the conversion of the upper barren anther below it into a short broad strap, firmly fixed to the edge of the stigmatic disk and retaining it with its face against the upper perianth-segment. The stigma thus held by the eunuch is safe from all pollution from her brother anthers behind her back, and is preserved intact for any pollen that may be inserted in the opening between the disk and the upper segment by insects or other agencies.

Stirlingia (which may resume Brown's name *Simsia*, if Persoon's earlier genus of that name merges into *Encelia*) has the peculiar open-celled anthers of *Conospermum* and *Synaphea*, two cells of adjoining anthers being applied face to face in the bud, forming together one globular or ovoid cell as in those genera; but the flower is regular, with the anthers all perfect, forming four closed cells round the style under the stigma, which is cup-shaped and almost closed in the bud, and expands into a disk as the flower opens, stigmatic on the upper surface, whilst the anthers have opened below it, as in the straight-flowered *Persoonias*.

EXPLANATION OF THE PLATES.

Plate I.

Fig. 1. *Petrophila longifolia*; bud cut open, style, and anther.
2. *Persoonia articulata*; bud cut open, and stamen.
3. *Persoonia saccata*; bud cut open.
4. *Banksia marginata*; bud cut open, style, and stamen.
5. *Grevillea buxifolia*; bud cut open, showing the appendage of the style closely bent back, and expanded flower with the appendage of the style spreading.
6. *Grevillea Wilsoni*; flower and detached style.
7. *Grevillea vestita*; bud, the same cut open, and detached style.
8. *Adenanthos obovata*; flower partially opened, and section of the upper portion.

Plate II.

Fig. 9. *Adenanthos pungens*; flower partially opened, section of the upper portion, and detached upper portion of the style.
10. *Agastachys odorata*; bud and the same cut open.
11. *Conospermum taxifolium*; flower, the same with the lower lip removed, showing the barren anthers in front of the style, and a flower cut open.
12. *Synaphea dilatata*: bud; *a*, the same with the lower lip removed, showing the perfect anthers in front of the style; *b*, the same with the lower and lateral lobes removed; *c*, stamens and style, lateral view, and perianth opened out.

In the figures of both Plates *s* indicates the stigma.

On the Varieties of *Aspidium angulare* and *aculeatum*. Extract from a letter to the Secretary by H. Reeks, Esq., F.L.S.

[Read March 16, 1871.]

North End, East Woodhay, Newbury,
March 14, 1871.

Dear Sir,—I have sent for exhibition a small series of the common *Aspidium*, from that of the simple *Lonchitis*-like form to that of the more highly developed "*subtripinnatum*." With the exception of one or two specimens at the end of the series, which are more intimately connected with the form called *angulare*, all the fronds are fully fructified, at any rate sufficiently so to reproduce their respective forms from seed. I have commenced the series with the lowest, or least-developed forms of *aculeatum*, and traced them up to that having perfectly stalked pinnules—a form not generally described by British botanists, unless it be included under the term *angulare*, from which it can scarcely be distinguished, except by its rigid growth and leathery texture, which, however, is scarcely appreciable in the dried and gummed-down specimen. I have therefore, this morning, gathered two specimens of each form, growing side by side—*aculeatum* with stalked pinnules, and *angulare* in its normal state.

The whole of the forms, with hundreds of others intermediate, grow in almost every lane in this parish (East Woodhay); and all those sent were gathered within the space of about 100 yards.

My experience here (and I have rarely met with any locality more favourable for the study of our common *Aspidia*) is, that it is very unusual to meet with what may be termed a luxuriant specimen of *angulare* which has not at least the first upper pinnule more or less subdivided, although this is not mentioned by Dr. Hooker in his 'Student's Flora,' except under *A. aculeatum*, Sw., which, Dr. Hooker says (evidently alluding to *A. angulare*), is "2–3-pinnate;" this latter is never the case with *A. aculeatum*, which, in its most highly developed state, *i. e.* with stalked pinnules, has only the inner and, sometimes, outer edge of the first upper pinnule spinulose-serrate.

Bryological Notes. By S. O. Lindberg, M.D.

[Read Feb. 16, 1871.]

Mr. Dickson, in his 'Pl. crypt. Brit.' fasc. 4, p. 16, t. 11. f. 13 (1801), has described, under the name of *Hypnum Teesdalei*, a moss which he considered to be new; but Smith, in his 'Fl. Brit.' vol. iii. p. 1306. no. 39 (1804), proved that this species was nothing else than *H. velutinum*, L., var. *β. intricatum* (Schreb.), and that the moss called *H. intricatum* by Dickson in his work quoted, fasc. 2, p. 10 (1790), must be a new one, to which Dr. Smith gave the name *H. Teesdalei.* It was described the same year by Mr. Turner in his 'Musc. Hibern. Spic.' p. 150. no. 16, the species and name having since been generally accepted.

The moss in question remained for a long time imperfectly understood, even by British authors, *e. g.* Hooker and Taylor, till Mr. Wilson, in his 'Bryol. Brit.', drew up the characters as they are found in nature, although we cannot accept all his synonyms, nor the figures given on plate 55. With regard to the delineation of the nerve, it is to be remarked that it is not continuous or subexcurrent, but ends just below the somewhat obtuse apex, as it is properly described by Wilson; and as to the synonyms, Wilson only followed the authors of the 'Bryologia Europæa,' who had, under *Rhynchostegium Teesdalei*, confounded two very distinct species of *Hypnum*, as I will now prove.

Of the two thus confounded in 'Bryol. Eur.,' one, the true *H. Teesdalei*, Sm., is there mentioned only among the synonyms; but the other, described and figured as *Rhyn. Teesdalei*, is a very different species, described by Bridel in his 'Sp. Musc.' ii. p. 111 (1812) as *H. curvisetum*, n. sp., a moss which has since received many different names, as the synonyms given below will show. To draw up a full history of this species would be tedious, and it may perhaps be sufficient if I give an accurate description of both.

H. Teesdalei, Sm., is a *Eurhynchium*, intermediate between *H. pallidirostre*, Brid. (*H. pumilum*, Wils., is the same, according to original specimens of both), and *H. filiforme*, Lam. (*H. Lamarckii*, DeC. 1805, or *H. velutinoides*, Bruch, 1848), with the nerve constructed nearly as in the leaf of *H. crassinerve*, Tayl.; the other, *H. curvisetum*, Brid., is a *Rhynchostegium*, allied to *H. serrulatum*, Hedw., var. *γ. confertum*, Lindb. (*H. confertum*, Dicks.), and

H. algierianum, Desf. (*Pterygynandrum*, Brid., 1798, or *H. tenellum*, Dicks., 1801).

I have seen *H.* (*Eurhynchium*) *Teesdalei*, Sm., from Sweden, Great Britain, Teneriffe, and Transcaucasia ("*in monte* Pruit *Somchetiæ*, 3 Sept., 1844" (n. 2623), Dr. Kolenati). I have specimens of *H.* (*Rhynchostegium*) *curvisetum*, Brid. (which seem to be more common, especially in the middle and south of Europe), from Germany, Holland, France, and Italy; but the species has not yet been observed, as far as we know, in Scandinavia and England.

1. HYPNUM (EURHYNCHIUM) TEESDALEI, *Sm.* *Planta autoica*, minor, multo rigidior, fere semper fusco-viridis et opaca; *caulis* decumbens, haud (vel vix) radiculosus, irregulariter ramosus, ramis longis, acutis, erectis, denuo irregulariter ramulosis, accrescenti-foliatis; *folia* sparsa, crassiuscula, rigida, apice leniter incurva et obliquula, profunde cochleari-canaliculata, e basi angustiore et crasse texta elongato-oblonga, acuta, apice summo obtusiusculo, nervo crassissimo, dorso valde prominente, apice summo dissoluto; *cellulis* basilaribus rectangularibus crassissimis, ceteris rhombeis, vel elongato-rhombeis, haud serpentinis, summis oblongis, omnibus sat valde incrassatis, sine utriculo primordiali libero et corrugato; *bracteæ perichætii* minimæ, apicem vaginulæ haud attingentes; *capsula* brevis, suberecta, paullo curvata, obovata, ore lato, a cellulis minutis, ellipticis vel oblongis, subconformiter valde incrassatis pachyderma; *annulus* inconspicuus, simplex, persistens; rostrum *operculi* brevius, cylindricum, obtusiusculum; *peristomium* pro more magnum, dentibus angustioribus; *spori* virides. *Andrœcia* pauca, in ramorum axillis inferioribus.

Hypnum intricatum (haud *Schreb.*) *Dicks. Pl. Crypt. Brit.* fasc. 2, p. 10, excl. synon. (1790); *Sm. Engl. Bot.* iii. n. 202 (1794).

H. Teesdalei (haud *Dicks.*) *Sm. Fl. Brit.* iii. p. 1291. n. 20 (1804), *et Comp. Fl. Brit.* 2 ed. p. 176. n. 20 (1816); *Turn. Muscol. Hib. Spic.* p. 150. n. 16 (1804); *Brid. Bryol. Univ.* ii. p. 416. n. 22 (1827); *Wils. Bryol. Brit.* p. 350. n. 21 (1855); *Berk. Handb. Brit. Moss.* p. 89. n. 19 (1863); *Zett. in Bot. Not.* p. 73, p. p.; *Hartm. Skand. Fl.* 9th ed. ii. p. 12. n. 68, p. p. (1864).

H. (Plumularia), *C. M. Synops.* ii. p. 400. n. 325, p. p. (1851), *et Deutschl. Moos.* p. 451. n. 66, p. p. (1853).

H. Teneriffæ, *Mont. Fl. Cell. Canar.* p. 3 (1840), *et Syll. Pl. Crypt.* p. 9 (1856).

H. pachyneurum, *Tayl. MSS.*; *Wils. Bryol. Brit.* p. 350, ut synon. (1855).

Delin. Engl. Bot. iii. t. 202: Mont. Pl. Cell. Canar. t. 3. f. 1; Wils. Bryol. Brit. t. 55.

Planta tenuior et interdum complanatulo-foliata. *Folia* fere undique

vergentia, sicco fere immutata, patentia, apice plus minusve obliqua, margine ubique plano, remote serrulato, apice densius et distinctius serrato. *Bracteæ perichætii* brevissimæ, apicem vaginulæ ovato-conicæ haud attingentes, latissime ovatæ; acuminatæ, acutæ, serratæ, enerves, laxius tectæ. *Seta* usque ad 1 cm. alta, brunneo-purpurea, recta vel leniter flexuosa, sat crassa, rigida, densissime scabra. *Capsula* plus minusve fusca, nunquam horizontalis, sicca sub ore leniter constricta. *Spori* minutissimi. *Andrœcia* minuta, crasse gemmacea, *bracteis* acuminatis, integris, enervibus, *antheridiis* copiosis, brevibus, ellipticis, paraphysibus nullis vel vix ullis, valde inconspicuis.

2. HYPNUM (RHYNCHOSTEGIUM) CURVISETUM, *Brid.* *Planta autoica,* major, vix rigida, lætevirens et distincte nitidula; *caulis* humifusus, radiculosus, plus minusve regulariter pinnatus, ramis brevibus, obtusiusculis, patentibus, haud erectis, subsimplicibus, æquali-foliatis: *folia* densiora, sat tenuia, haud rigida, apice recta et æqualia, canaliculata, e basi vix angustiore et tenuius texta ovato-lanceolata, acutissima, nervo multo tenuiore, dorso paullo prominente, ad vel paullo supra medium dissoluto, *cellulis* basilaribus rectangularibus, tenuibus, ceteris linearibus, angustis, serpentinis, summis elongato-oblongis, omnibus haud incrassatis, utriculo primordiali libero et corrugato; *bracteæ perichætii* majores, longiores et numerosiores, apicem vaginulæ sat longe superantes; *capsula* major, longior, curvata, horizontalis, ellptica, ore minore, a cellulis triplo vel quadruplo majoribus, rotundis, præsertim ad angulos maxime incrassatis, magis pachyderma; *annulus* latus, duplex, vix persistens; rostrum *operculi* longius, sensim acutius; *peristomium* pro more minus, dentibus latioribus; *spori* luteo-ferruginei. *Andrœcia* copiosiora, in axillis ipsius caulis.

H. curvisetum, *Brid. Sp. Musc.* ii. p. 111 (1812).

H. tenellum (haud *Dicks.*) *Schwægr. Suppl.* ii. P. i. fasc. 2. p. 161. n. 5, excl. synon. (1824).

H. laxopinnatum, *Brid. Bryol. Univ.* ii. p. 405, ut synon. (1827).

H. rutabulum, var. i. tenerrimum, *Brid. Bryol. Univ.* ii. p. 488 (1827).

H. rutabuloides, *Brid. Bryol. Univ.* ii. p. 488, ut synon. (1827).

H. Schleicheri, *Spreng.* (*L.*) *Syst. Veg.* 16th ed. iv. pt. i. p. 208. n. 106, p. p. (1827); *De N. in Mem. Accad. Torin.* xxxviii. p. 224. n. 26, excl. synon. (1836), *et Syll. Musc. Ital.* p. 32. n. 44 (1838); *F. Mazz. Spec. Bryol. Rom.* 2nd ed. p. 50 (1841).

—— var. β. curvisetum, *Schwægr. Suppl.* i. pt. ii. pp. 239 et 241 (1816); *Brid. Bryol. Univ.* ii. p. 404 (1827); *Hüben. Muscol. Germ.* p. 618 (1833); *Rab. Deutschl. krypt. Fl.* ii. pt. iii. p. 282 (1848).

H. Teesdalei (haud *Sm.*), *Hüben. Muscol. Germ.* p. 618. n. 10 (1833); *Hamp. in Flora,* xx. pt. i. p. 276. n. 71 (1837); *Spruc. in Trans. Bot.*

Soc. Edinb. iii. p. 141. n. 66 (1849)? *Zett. in Bot. Nat.* 1863, p. 73, p. p.; *Hartm. Skand. Fl.* 9th ed. ii. p. 12. n. 68, p. p. (1864).

H. Teesdalei (Plumularia), *C. M. Synops.* ii. p. 400. n. 325, p. p. (1851), et *Deutschl. Moos.* p. 451. n. 66, p. p. (1853).

H. litoreum, *De N. Syll. Musc. Ital.* p. 31. n. 43 (1838).

—— (Plumularia), *C. M. Synops.* ii. p. 399. n. 323 (1851).

H. Jacquini, *Gar. Bryol. Austr. Exc.* p. 82 (1840), et *Enum. Musc. Austr.* p. 42 (1840).

—— (Anomodon), *C. M. Synops.* ii. p. 481. n. 1 (1851).

H. rigidulum, *Bruch, MSS.*; *Rab. Deutschl. krypt. Fl.* ii. pt. iii. p. 286. n. 6588 (1848).

Rhynchostegium Teesdalei, *Br. Eur.* fasc. 49–51, *Monogr.* p. 6. n. 3, excl. synon. mult. (1852); *Schimp. Coroll.* p. 116. n. 3 (1855), et *Synops.* p. 566. n. 3 (1860); *Picc. Elench. Musch. Ligur.* p. 10. n. 24 (1863); *De N. Cron. Briol. Ital.* ii. p. 13. n. 26 (1867), et *Epil. Briol. Ital.* pp. 70 et 87 (1869); *M. Lang. in Bot. Tidskr.* ii. p. 251 (1868).

Hypnum Teesdalei, var., *Wils. Bryol. Brit.* p. 351, in obs. (1855).

Eurhynchium Teesdalei (haud *Lindb.*), *Mild. Bryol. Siles.* p. 313. n. 471 (1869).

Delin. Br. Eur. Monogr. t. 3; Schwægr. Suppl. t. 144.

Planta robustior et vulgo distincte complanatulo-foliata. *Folia* fere undique vergentia, sicca leniter hic illic curvata et torquata, patentia, apice recta nec obliqua, margine interdum ad basim indistincte recurvo, paullo infra medium folii serrulato, apice densius et distinctius serrato. *Bracteæ perichætii* longiores, vaginulam ovato-conicam sat longe superantes, latissime ovatæ, acuminatæ, acutæ, serratæ, enerves vel interdum vestigia nervi gerentes, structura fere foliorum. *Seta* 6–8 mm. alta, purpurea, leniter flexuosa, apice (interdum cygneo-)curvata, ut fiat capsula horizontalis, tenuiuscula, densissime scabra. *Capsula* luteola, sicca sub ore leniter constricta. *Spori* minutissimi. —*Andrœcia* eisdem præcedentis simillima, *antheridiis* tamen longioribus, oblongis, et paraphysibus distinctis.

Our original specimens of *H. curvisetum*, Brid. ("Romæ, in muris humidis montis Viminalis, Apr. 1806"), agree in every respect with fig. 1, Br. Eur. *l. c.*

Var. *β*. LONGINERVE, *Lind.*

Planta tenella et magis nitidula, foliis angustioribus, sensim acutissimis, nervo longiore.

Hypnum obscurum (haud *P. B.*) *Brid. Sp. Musc.* ii. p. 115 (1812), et *Mant. Musc.* p. 158. n. 703 (1819)?

H. riparium, var., *Schwægr. Suppl.* i. pt. ii. p. 195 (1816)?

H. Schleicheri, var. *γ*. obscurum, *Brid. Bryol. Univ.* ii. p. 405 (1827)?

This variety grows in Switzerland (ded. Hampe), and near Vienna (Juratzka).

It is very like *H.* (*Rhynchost.*) *algierianum*, but is instantly distinguished by its scabrous seta, and from *H. Teesdalei*, Sm., by the form and areolation of the leaves, the thinner and narrower nerve, the areolation of the capsule, &c.

The very interesting *Habrodon Notarisii*, Schimp., has lately been found growing both in Great Britain and Norway. It was previously known only from Italy and the Pyrenees; but I do not think it constitutes a proper genus. Its nearest ally is the North-American *Clasmatodon parvulus* (Hamp.), Sull. (*Cl. pusillus*, H. W.), from which I find it impossible to distinguish it generically. I consider the European species to be also a *Clasmatodon*, among the forms of which I should also place the very rare *Anisodon Bertrami*, Schimp. With regard to *Dubyella italica*, Schimp., I do not think it a sufficiently distinct genus; judging from the excellent figures and description in 'Musci Novi Europæi,' it must be a *Leskea*.

I now give the synonyms of the three species of *Clasmatodon*, so as to render the history of the genus more complete.

1. CLASMATODON PARVULUS (*Hamp.*), *Sull.*

Leskea parvula, *Hamp. in Linnæa*, xiii. p. 46. n. 59 (1839).

Clasmatodon pusillus, *H. W. in Drumm. Musc. St. Austr. Am. Bor.* n. 80 (1841); *Wils. in Hook. Journ. Bot.* iv. p. 421. n. 3 (1842); *Sull. Musc. Allegh.* p. 23. n. 80 (1846).

Rhegmatodon parvulus, *Hamp. Ic. Musc.* ii. n. 14 (1844).

Hypnum (Capillaria) parvulum, *C. M. Synops.* ii. p. 409. n. 341 (1851).

Hypnum (Helicodontium) parvulum, *Mitt. in Journ. Linn. Soc.* xii. p. 549. no. 7, *in obs.* (1869).

Pterogonium marginatum?, *Schwein. MSS. Br. Eur.* fasc. 49–51, (Anisodon) p. 4 (1852).

Anisodon acutirostris, *Schimp. in Br. Eur.* fasc. 49–51, *Monogr.* p. 4 (1852).

Clasmatodon parvulus, *Sull. in A. Gray, Man. Bot. U. S.* 2nd edit. p. 660. n. 1 (1856), *et Ic. Musc.* p. 126 (1864).

Delin. A. Gray, Man. Bot. U. S. 2nd edit. t. 5; Hamp. Ic. Musc. t. 14; Hook. Journ. Bot. iv. t. 25 A; Sull. Ic. Musc. t. 79.

2. CLASMATODON PERPUSILLUS (*De N.*), *Lindb.*

Pterogonium perpusillum, *De N. Muscol. Ital. Spic.* p. 12. n. 22 (1837), *Syll. Musc. Ital.* p. 84. n. 109 (1838); *C. M. Synops.* ii. p. 84. n. 1 (1850).

Pterogonium? subenerve, *Spruc. in Trans. Bot. Soc. Edinb.* iii. p. 150. n. 111 (1849).

Habrodon Notarisii, *Schimp. Synops.* p. 505 (1860), *et Musc. Nov. Eur.* fasc. 3 et 4, *Monogr.* p. 2 (1866); *De N. Cron. Briol. Ital.* ii. p. 40. n. 141 (1867), *et Epil. Briol. Ital.* p. 223 (1869).

Habrodon perpusillus, *Lindb. in Œfv. V. Ak. Förh.* xx. p. 401, n. 34 (1863).

Delin. Schimp. Musc. Nov. Eur. Monogr. t. 1.

3. CLASMATODON BERTRAMI (*Schimp.*), *Lindb.*

Neckera (Leptohymenium) perpusilla, *C. M. Synops.* ii. *Suppl.* p. 666. n. 79 *b*, *Ecl. Synon.* (1851), *et Deutschl. Moos.* p. 383. n. 10, p. p. (1853).

Anisodon perpusillus, *Br. Eur.* fasc. 49–51, *Monogr.* p. 4 (1852); *Schimp. Coroll.* p. 103. n. 1 (1855).

Anisodon Bertrami, *Schimp. Synops.* p. 506 (1860); *Rab. Krypt. Fl. Sachs. &c.* i. p. 543. n. 295 (1863); *Mild. Bryol. Siles.* p. 274. n. 415 (1869).

Delin. Br. Eur. Monogr. t. 1; C. M. Deutschl. Moos. p. 384; Schimp. Synops. t. 5.

In his 'Obs. Bot.' p. 27 (1803), Dr. Mohr established the new genus *Leptodon* on *Pterygynandrum trichomitrium* and *subcapillatum*, and also added to it *Hypnum Smithii*, to judge from his words:—"uti *Pt. trichomitrium*, *Pt. subcapillatum*, necnon *H. Smithii* Dicks., cf. Sw. in 'Diar. Bot.' Schrad. iv. p. 173." The genus in question must of course first include *L. trichomitrius* and its allies; but among these I cannot admit *L. Smithii*, because that plant shows greater affinity with *Alsia abietina* (Hook.) Sull., having the same habit, involute branches and stems, &c.; and it has also an inner peristome, represented by a coroniform membrane. Hence, in my opinion, *H. Smithii* is the lowest form of the genus *Alsia*, Sull., not of *Leptodon*, Mohr, emend.

Two species of *Fabronia* have long been known to grow in Europe—*F. octoblepharis* (Schleich.), Schwægr., and *F. pusilla*, Radd. De Notaris in his 'Epil. Briol. Ital.' (1869) has divided the latter species into two, of which one, *F. pusilla*, is a more northern species, and, in my opinion, intermediate between *F. octoblepharis* and the more southern *F. Schimperi*. If this is not allowed to be a good species, all three must be united into one, because it has the same relation to *F. pusilla* as this latter to *F. octoblepharis*.

I will now give the differential characters between the two former, but leave unnoticed the distinction between their respective fruits, because the vegetative system will always furnish sufficient characters.

1. **Fabronia Schimperi**, *De N.* *Planta* vulgo paullum major, demum luteola, magis plumulosa; *folia* majora et longiora, lanceolata, ciliato-laciniata, laciniis sæpe ciliatis vel grosse serratis, minus concava, nervo distinctiore; *cellulis* alaribus copiosioribus, ceteris multo majoribus et longioribus, elongato-rhombeis, valde incrassatis, vulgo inanibus.

Fabronia Schimperi, *De N. Epil. Briol. Ital.* pp. 226 et 228 (1869).
Delin. Br. Eur. Monogr. t. 1 (excl. fig. 6, ad *F. octoblepharim* pertinente).

2. **Fabronia pusilla** (*Radd.*), *De N.* *Planta* vulgo paullum minor, semper viridis, minus plumulosa; *folia* minora et breviora, ovato-ovalia, infra apicem lacinulis duabus fere oppositis, ceterum ciliato-serrata vel solum serrata, magis concava, nervo minus distincto; *cellulis* alaribus paucioribus, ceteris minoribus brevioribus, rhombeis vel quadrato-rhombeis, vix incrassatis, semper chlorophyllo farctis.

Fabronia pusilla, *Radd., De N. Epil. Briol. Ital.* pp. 226 et 227 (1869).
Delin. Schwægr. Suppl. t. 99.

Note on *Capparis galeata* (Fresen.) and *C. Murrayii*, J. Graham. By N. A. Dalzell, Esq. (Communicated by Dr. Hooker, V.P.L.S.)

[Read March 16, 1871.]

The late Dr. Anderson, in his 'Florula Adenensis,' has united these two species. Having gathered both in their native localities, I am enabled to say that, in general appearance, no two species of a genus could be more unlike. *C. Murrayii* is a very small straggling shrub, with small, thin, delicate leaves, pubescent, particularly when young, and found growing in the climate of Bombay, with from 100 to 300 inches of rain in the year; and it seems, at first sight, very improbable that the same species, growing in a perfectly arid climate like that of Sind and Arabia, should then present the appearance of a luxuriant bushy shrub, 3 feet and more in height, that the leaves should increase to four times the size, become thick and fleshy, and should, *in the desert*, lose every trace of pubescence. Such changes are the reverse of what we are led to expect in any single species growing *naturally* in two such opposite climates.

I find, on reexamining my specimens, that the leaves of these plants differ in *form*, as well as in size and texture, and that the difference appears constant.

C. galeata has *broadly ovate* leaves, which Dr. Anderson calls thick, and Decaisne cartilaginous, and which are entirely glabrous even in their earliest stage; they are 2 inches long and 1¼ broad. The leaves of *Murrayii* are orbicular, or nearly so, 1 inch long and 1 inch broad, very tender, almost membranous, and, in their young state, almost tomentose.

The filaments, anthers, and pollen in *C. galeata* are white; in *Murrayii* these parts are purple. In the ovary of the former there are ten parietal placentæ; in that of the latter, *only four*.

The peduncles in *C. galeata* are articulated with the stem, and, when they fall off, leave a circular scar, with a free smooth margin; in *C. Murrayii* there does not appear to be any articulation.

These distinctions appear to be of essential value.

I am inclined to lay great stress on the improbability of a plant with two natural habitats, exhibiting in the desert one a degree of luxuriance to which it is a stranger in its other home in the tropical forest. If the circumstances had been reversed, it would be just what our experience of the effects of climate would induce us to admit.

C. ægyptiaca, which is also a native of Sind, has such a close resemblance to *C. Murrayii* that there is no difficulty in believing them one and the same; but I must look on *C. galeata* as a very distinct species.

Milbrook House, Carlisle,
February, 1871.

[From the printed descriptions and what materials are at Kew, it seems to me that Dr. Anderson was probably right in uniting *Capparis galeata* (Fresen.) and *C. Murrayiana* (not *Murrayii*), Grah.

Mr. Dalzell lays much stress on the habit, size, &c. of this plant, in (1) Bombay proper and (2) Sind and Arabia, being the reverse of what might be expected, on ordinary rules, as to the variation of a plant owing to more or less moisture; but these rules are not quite inelastic, or always dominant.

The various items touched on and expressed by Mr. Dalzell, with the views I have had to form on them, are these:—

1. The leaves of both so-called species vary very much in size.
2. The same as to shape.
3. Both are apt to be thick (probably, when fresh, somewhat succulent?).
4. *C. Murrayi* is at times glabrous even when young.
5. The peduncles of both appear to be articulated; and
6. The anthers of *C. Murrayi* also seem to be purple.
7. There is not material to *settle* the question of number of placentas; but *C. Murrayi* is not restricted to *four*.

Finally, I conceive that Dr. Anderson might perhaps well have gone further, and clubbed these with *C. spinosa*, L., as varieties at most.—L. F. Stewart, M.D.]

Kew, May 1, 1871.

Notes on some Plants from Northern China. By Henry F. Hance, Ph.D. &c. (Communicated by Dr. J. D. Hooker, C.B. &c. &c.)

[Read June 1, 1871.]

The following brief notes were drawn up when examining and laying in the herbarium various plants selected from small collections made, for the most part, in the neighbourhood of Peking, by Dr. Emil Bretschneider, Physician to the Imperial Russian Legation, Dr. Wells Williams and the late Mr. Richard Conolly, respectively Secretaries to the United States and our own Legations in that capital, and especially the Rev. Father Armand David, priest of the "Congrégation des Missions Etrangères," a most zealous naturalist, to whose courtesy I am indebted for many rare and interesting species, some of the novelties amongst which I have already been privileged to dedicate to their accomplished discoverer. These notes mainly refer either to species apparently new to science, to such as are so imperfectly known that any additional information regarding them may be assumed to be useful, or to others not previously enumerated, either in the 'Index Floræ Pekinensis' of M. Maximowicz (a catalogue the materials for which must have been amassed under great difficulties, but which is nevertheless remarkable for its accuracy and completeness) or in the botanical section of Radde's 'Reisen in Ost-Sibirien' (where Dr. Regel has described several interesting plants collected by Dr. Tatarinow and others). To these I have added a few species which, previously recorded only from the north of the empire, have recently been detected in the extreme south, the majority of them by Mr. Sampson. In connexion with the two latter categories of plants, I have essayed to impart a geographical interest to an otherwise bald enumeration, by mentioning the nearest localities previously known. It is scarcely possible for a botanist quite isolated from scientific society, and restricted to his own limited collection of books and plants for the requisite data, to avoid errors and omissions in such a record; and for all such as may exist in this brief paper, I ask the indulgence of naturalists more happily situated for purposes of study than myself.

British Vice-Consulate, Whampoa,
March 3, 1871.

1. CLEMATIS (FLAMMULA) TUBULOSA, *Turcz.*?—In umbrosis collium ab urbe Peking occidentem versus, Augusto, 1866, coll. Dr. S. W. Williams.

I have little doubt that Dr. Williams's plant, which he describes as "a coarse vigorous annual, with rank-smelling purple flowers," is referable to this species, only known to me, however, from Walpers's 'Repertorium;' but if so, Turczaninow's diagnosis is not satisfactory. In the Peking specimens, the lower leaves are trisect, the upper trilobed only, or merely irregularly slashed, usually sparsely hairy, and prominently reticulate; the cohesion of the sepals, though evident, is very slight, and at full anthesis they become free to the base; the anther is scarcely longer than the filament; and the flowers are apparently polygamous; for in the same corymb I find both staminal flowers, and pedicels from which the calyx has fallen, surmounted by the plumose ovaria. From Ku-pei-kaú, growing in dry places along roadsides, I have, also gathered by Dr. Williams, a plant with hermaphrodite blossoms, solitary and long-stalked, or arranged in a few-flowered raceme, each flower borne on a pedicel an inch or more in length; but the foliage and calyx are so similar that I do not doubt its being a mere variety of *C. tubulosa.* This approaches somewhat to the rare *C. stans*, S. and Z., which is unquestionably the nearest ally of Turczaninow's species; but in that the flowers (which are doubtless also polygamous, not strongly diœcious) are more than twice as small, short-stalked, and arranged in 2–3 distant clusters, forming a raceme. As the sections are limited in the 'Flora Indica,' *C. tubulosa* would, from its inflorescence, fall rather into *Cheiropsis*; but its affinities are against such a collocation.

2. NASTURTIUM GLOBOSUM, *Turcz.*?—In paludosis, Pagoda Hill, juxta Peking, m. Augusto, 1867, legit Dr. S. W. Williams.

The Peking plant, which I have little doubt is referable to the above species, is certainly identical with the South-Chinese one described by me (Seem. Journ. Bot. iii. 378) under the name of *N. cantoniense.* Ledebour places it in the genus *Cochlearia,* though its nearest affinity is incontestably with the North American *N. hispidum*, DC.; whilst Turczaninow (Flor. Baic.-Dahur. i. 109) remarks on its relationship to *Tetrapoma*, which Dr. Asa Gray once regarded as a monstrosity of *N. terrestre*, R. Br., an exceedingly close relative of the Chinese plant *. In ag eneral classification, it would seem very desirable, if possible, to retain the genus *Roripa* for those plants which oscillate between *Nasturtium* and *Cochlearia*.

3. DRABA NEMOROSA, *L.*, β. LEIOCARPA, *Led.*—In agris circa Jehol, Maio, R. P. David.

Found in Japan and Manchuria, but not before, to my knowledge, recorded from China proper.

4. LINUM DAVURICUM, *Schult.*—E paradiso imperiali aliisque juxta Peking locis specimina miserunt Dr. S. W. Williams et Rev. A. David.

I think Miquel has rightly identified Planchon's *L. stelleroïdes* with this. Planchon's diagnosis (Hook. Lond. Journ. Bot. vii. 178) must have been drawn up from starved specimens; for I find the leaves in well-developed ones as much as 9 lines long and a line wide. Miquel describes the inner sepals as without glands; but these appendages are variable both in number and prominence. Father David notes the petals as being rose-coloured and conspicuous. This species has perhaps as much claim to be placed under *Linastrum*, § *Dicrolinum*, as under *Eulinum*, § *Adenolinum*, where Planchon with doubt located it. Dr. Williams tells me that *L. usitatissimum* is grown at Kalgan, but only as an oil-seed-yielding plant, not for its fibre.

5. PEGANUM NIGELLASTRUM, *Bge.* Caulibus angulatis sulcatis retrorsum aculeolatis, foliorum obscure glandulosorum marginibus arcte

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* Maximowicz had previously stated (Prim. Fl. Amur. 43) that *Tetrapoma* is not generically separable from *Nasturtium*.

revolutis, stipulis sæpius obsoletis, fructu sphærico capsulari sepalis pectinato-pinnatifidis duplo fere breviore, seminibus angulatis compressiusculis curvulis testa suberoso-incrassata minute scrobiculata, embryone ob seminis formam curvulo.—Ad vias prope Cha-tau, in siccis lapidosis, terræ adpressum, Sept. 1867, legit Dr. S. W. Williams.

This genus is placed by Bunge, in the 'Reliquiæ Lehmannianæ'), and, following him, by Boissier (in *Zygophyllaceæ* rather than in *Rutaceæ*, where it is left without any remark by Bentham and Hooker, and since by Le Maout and Decaisne. In the present species there are evident signs of glandular dots on the leaves, and the stipules are usually suppressed; and though the embryo would be quite straight were it not for the curvature of the seed, the copious albumen and absence of staminal scales are in favour its Rutaceous position. By its solitary flowers it differs from all the other members of the tribe Ruteæ, and may perhaps be regarded as an osculant genus.

6. EUONYMUS BUNGEANUS, *Maxim.* Capsula flavida 4-loba lævi glabra apice depresso-complanata acutangula aptera valvis obcordatis, arillo carnoso miniato totum semen obvolvente.

Father David, from whom, as well as Dr. Bretschneider, I have received this, speaks of it as an "arbre médiocre."

7. VITIS ACONITIFOLIA (AMPELOPSIS, *Bge.*).

According to Dr. Wells Williams, the fruit of this vine, which seems not uncommon in the hills around Peking, ripens at the approach of frost, and is very sweet and juicy.

8. VITIS FICIFOLIA, *Bge.*—E provincia Fokien, circa Amoy, a. 1858, misit C. de Grijs: in insula Formosa, prope Tam-sui, Apr. 1864, invenit def. R. Oldham.

Though cordially agreeing with Professors Asa Gray and Miquel in reducing *V. Thunbergii*, S. & Z., to *V. Labrusca*, L., I am disposed to think they go too far in referring the present plant, which has much smaller leaves and a different *facies*, to that species. Regel considers it a form of *V. vinifera*, L.

9. PISTACIA CHINENSIS, *Bge.* Arbor 50–60-pedalis, paniculis fructigeris folio duplo brevioribus strictis angulatis ramis divaricatis brevibus, drupis compressis oblique gibbosis apice obtusissimis pedicellum duplo superantibus.—In montibus ditionis Pekinensis rarius invenit am. Dr. S. W. Williams, m. Aug. 1867.

This is nearest *P. palæstina*, Bois., which it resembles in the size and shape of its fruit, and its paripinnate leaves, by which latter character the distinction between De Candolle's two sections is reduced to the deciduous or persistent foliage.

10. OXYTROPIS SUBFALCATA, sp. nov. Acaulis, foliolis multijugis falcato-oblongis basi rotundatis apice acutis utrinque cum petiolo adpresse albo-pilosis, stipulis scariosis lanceolatis hispidis longe subulato-acuminatis, pedunculis folia duplo superantibus plurisulcatis sulcis pilis albis adpressis notatis apice laxe racemoso-multifloris, floribus ut videtur purpureis brevissime pedicellatis, bracteis setaceis tubum calycis campanulati albo-pilosi setaceo-dentati æquantibus, vexillo orbiculari integro alas carinamque longirostrem inter se fere æquales parum superante.—In campis editioribus ditionis Pekinensis, m. Aug. flf. legit Dr. S. W. Williams (Exsicc. n. 14889).

Allied to *O. cærulea*, DC.

11. OXYTROPIS PSAMMOCHARIS, sp. nov. Acaulis, foliolis conjugatis vel sæpius 4–6 subverticillatis lineari-oblongis acutiusculis utrinque villoso-hirsutis, scapis folia fere duplo superantibus pilis crispulis tomentosis, floribus sessilibus in capitulum densum globosum in fructu oblongum congestis, bracteis subulatis calyce cinereo-hirsutissimo tubuloso-campanulato brevioribus persistentibus, petalis ex sicco roseis, vexillo orbiculari emarginato alas parum excedente, leguminibus ovoideo-globosis gibbis inflatis albido-pilosis calyce duplo longioribus sutura superiore tantum introflexa unilocularibus stylo sursum uncinato coronatis, seminibus fusco-olivaceis nitidissimis.—Herba decumbens, in planitiebus aridis sterilibus supra pylas "Nan-kau Pass," Chinæ borealis, sabulosa ornans, obvenit m. Sept. 1867, amiciss. Dr. S. W. Williams (Exsicc. n. 14685).

Allied to *O. verticillaris*, DC., *O. oxyphylla*, DC., *O. bicolor*, Bge., and especially *O. microphylla*, DC.

12. LESPEDEZA FLORIBUNDA, *Bge.*

Dr. Bretschneider sends a pretty plant agreeing well with the detailed description of this species given by Bunge in his 'Plantarum mongholico-chinensium Decas,' published at Kazan in 1835. Bunge alludes to its affinity to *L. violacea α. divergens*, Torr. & Gr.; but it is still nearer, I think, to *L. Stuvei*, Nutt., *γ. virgata*. Its closest ally, however, is no doubt *L. bicolor*, Turcz., from which it is readily known by its bright herbaceous green colour, its papyraceous more cuneate leaves, pallid beneath, and the subulate deeper calyx-teeth. Bunge speaks of the keel as being "apice fere in morem *Oxytropeos* subacutata;" but I find it quite as blunt as in *L. bicolor*. This very distinct genus is well worth a careful monograph, the specific limits being ill-defined. I think it very questionable if the sections instituted by Torrey and Gray will be found to hold good on a general revision.

13. Cassia nictitans, *L.*—In humidis umbrosis paradisi imperatorii prope Peking, Aug. 1866, leg. Dr. S. W. Williams.

Recorded by name in Maximowicz's 'Index.' The Chinese specimens, however, differ from the American I possess by being slenderer, by having narrower, acuter, more falcate leaflets, the petiolar glands smaller, flatter, and quite sessile, the stipules and bracts much narrower at the base *i. e.* (more truly subulate) and the pedicels as long as the flowers, which are solitary. Hence I was disposed to regard it as a distinct but closely allied species, under the name of *C. pseudo-nictitans*; but I observe that the most important distinguishing marks I relied on are included in the diagnosis given by Prof. Grisebach (Fl. Brit. W. Ind. 211). The occurrence of this North-American and Caribbean species in Northern China is remarkable: it has not hitherto been found in Japan, whence two or three others, common tropical weeds, are alone known.

14. Potentilla davurica, *Nestl.*

Father David, who sent me the species from the mountains around Peking, noted on his tickets that it has "fleurs jaunes." Ledebour, Lehmann (in his 'Revisio Potentillarum') and, I believe, all authors describe them as white. Do they vary in colour? or was there a *lapsus scriptorius* on the part of M. David? In the dried state they are no paler than those of *P. fruticosa*, L.

15. Potentilla discolor, *Bge.*—In montosis Jehol, Maio floriferam invenit R. P. David.

My *P. formosana*, which I had approximated conjecturally to this, is not specifically distinct: one of Father David's specimens has similarly thickened root-fibres.

16. Potentilla amurensis, *Maxim.*—In alluviis a fluvio anno præterito depositis, ad angiportam Shiu-hing, fl. West River, prov. Cantoniensis, d. 7 Februarii 1867, collegit T. Sampson.

The extension of this plant, only known hitherto from the Amur territory, into South-east China, is very interesting. Mr. Sampson's specimens agree in all respects with authentic ones received from M. Maximowicz. Regel's figure (Tent. fl. Ussur. t. iv. f. 1) is very good.

17. Agrimonia viscidula, *Bge.*—In saxosis fruticulosis collis cal-

carei Kun-yam-ngam, necnon in montibus Pakwan prope Cantonem, legg. Sampson et Hance, Julio 1844–46.

The Canton specimens are quite similar to Maximowicz's Nagasaki and Dr. Williams's Peking ones. I have specimens of the closely allied *A. pilosa*, Ledeb., gathered by Mr. Swinhoe at Talien-wan, and by Mr. Conolly at Port May (Vladi Vostock). I do not find the leaves of this latter narrower, as stated by F. Schmidt (Flor. Sachalin. 127), nor the pubescence on the under surface of the leaves thicker, but quite the contrary in each respect: *A. viscidula*, however, is much laxer and more diffuse in habit, and has loose interrupted-flowered racemes; whilst *A. pilosa* is thick-set, and has dense spiciform racemes; the primary veins of the leaves also are more conspicuous.

18. COTYLEDON FIMBRIATA (UMBILICUS, *Turcz.*).

Father David sends specimens of this from rocks in the mountains near Peking and Jehol, with leafy stems 3 inches high, and a dense cylindrical spiciform raceme 2 to 5 inches long. Other specimens, gathered by Dr. Wells Williams at Kalgan, by the Great Wall, are perfectly stemless, and with the inflorescence still denser, but distinctly pyramidal in outline, 3 inches long and 1½ inch across at the base close to the ground. In all these I find the corolla-segments not milk-white, as described by Turczaninow, but more or less tinged with reddish lilac, and, as well as the calyx, distinctly spotted with the same colour. I infer from this that Maximowicz's *Umbilicas ramosissimus* is not specifically distinct. The same author's *U. erubescens* has been already reduced by Regel to *C. spinosa*, L., which thus, like the present species, varies both in inflorescence and the colour of the flowers.

19, SEDUM DRYMARIOIDES, *Hance*.—**In rupibus ditionis Pekinensis, comite *Bæa hygrometrica*, R. Br., satis raro crescens, a. 1866, detexit Dr. S. W. Williams.**

This is undoubtedly the same as Mr. Sampson's Canton-province *trouvaille*. The northern plant is only 3 inches high, the leaves smaller and broader, the inflorescence more contracted and simpler, and the anthers yellow, not dark purple; but the flowers are less advanced, and there is no fruit. Dr. Williams remarked the resemblance of the flower to that of *Stellaria*.

20. CIRCÆA MOLLIS, *S. & Z.*—**In silvis ditionis Pekinensis, m. Maio florentem, detexit Rev. A. David, Miss. Apost.**

This is doubtless identical with the plant found by Maximowicz along the Ussuri. It agrees well with Zuccarini's diagnosis, and is considered by Miquel identical with the Japanese plant. There can be no doubt, I think, of its perfect distinctness as a species.

21. ŒNANTHE STOLONIFERA, *DC.*—?Prope Peking, m. Octobri 1860, coll. R. Swinhoe.

I have not seen the Indian plant; but this agrees very well with DeCandolle's diagnosis and Wight's plate (Ic. Pl. Ind. Or. ii. t. 571). It may be the "genus novum affine *Dasylomæ*" (sic) of Maximowicz's 'Index Fl. Pekinensis.' Another species of the same section, which is apparently the same as Miquel's *D. japonicum*, has been gathered by Mr. Sampson in waste places around Canton. In this the umbels are usually about 15-rayed.

22. SELINUM (CNIDIUM) MONNIERI, *L.*—In ripis limosis fl. West River, prov. Cantoniensis, locis eluvionibus obnoxiis, m. Junio 1865, detexit T. Sampson.

I do not happen to possess European specimens; but Mr. Sampson's plant agrees quite well with Koch's diagnosis and with the careful description in v. Wulfen's 'Flora Norica phanerogama.' This is another instance of the southward extension of North-east Asiatic plants to which I have already called attention, the species being recorded from Northern China, Davuria, and the Amur and Ussuri territories.

23. DIERVILLA FLORIDA, *S. & Z.* Calycis laciniis linearibus vel lanceolatis glabris v. pilosis, corolla vivide roseo-purpurea, antheris omnino liberis, stigmate magno peltato, capsulæ cylindraceæ hirtellæ 10–11 lin. longæ valvis coriaceo-sublignosis tenuiter 5-costatis marginibus inflexis cartilagineis, tubi calycini parte superiore septum liberum coronante ultra carpophylla in rostrum trilineale producta.—In frigidioribus montium prope Jehol, flf. et frf. collegit R. P. Arm. David; e montibus ad occasum metropoleos Peking sitis spec. florigera misit Dr. Bretschneider.

Prof. Asa Gray remarks that *D. Middendorffiana* has a thin capsule (it is described as *coriaceous* in the 'Florula Ochotensis'), by which character and by the persistent calyx-limb it shows an affinity to the American species, though very different in the form of the corolla. The North-Chinese plant, however, with its rigid indurated fruit and deciduous calyx-limb, agrees entirely with the Japanese species, especially *D. floribunda* as figured by Zuccarini (Fl. Jap. t. 32. fig. 8). The size and shape of the calyx-segments vary a great deal, as does also the degree of cohesion between them; for I find them sometimes united for half their length, and at others distinct to the base. The seeds have unfortunately dropped from my specimens. It is clear that the two sections founded by Alph. DeCandolle are untenable; and, the Ochotsk species agreeing with the Japanese and North Chinese ones in the form of the corolla, and with the North American in the texture of the capsule and permanent calyx-limb, it seems impossible to separate these sectionally. The specimens I have seen vary so much in aspect that I am inclined to doubt whether A. DeCandolle's *Weigela pauciflora* is distinct.

24. **Pyrethrum indicum**, *Cass.*, var.—In collibus Chinæ borealis prope Ku peh kau, Sept. 1866, invenit Dr. Williams.

The flowers of this are of a beautiful rose, whilst they are always yellow in the wild plant from the south; the leaves also are smaller; but I do not find any thing to denote specific difference.

25. **Artemisia annua**, *L.*—In muris urbis Peking, Aug. 1863, invenit Dr. S. W. Williams.

Omitted from Maximowicz's 'Index.'

26. **Androsace saxifragifolia**, *Bge.*

The opinion I expressed in the 'Adversaria,' that *A. patens*, C. Wright, is identical with this species, has been fully confirmed by Peking specimens received from Dr. Williams and Père David, which entirely agree with the Formosa plant determined in Mr. Swinhoe's published list by the late Mr. Alan Black as *A. patens*. It is very near the Indian *A. rotundifolia*, Hardw.

27. **Ligustrum japonicum**, *Thbg.*, var. Ramulis minute pubentibus, foliis carnosulis obovatis obtusis vel sæpius retusis $1\frac{1}{4}$–$1\frac{1}{2}$-pollicaribus 8 lin. latis, paniculæ terminalis coarctatæ rachi tomentosa.—Peking, Julio 1870.

This, Dr. Bretschneider states, on native authority, is used for rearing the wax-insect on. It looks different enough from the normal form, very well figured by Thunberg (Fl. Jap. t. 1), which I possess from Nagasaki; but I have no doubt it belongs to the same species, respecting which Blume writes (Mus. Bot. Lugd.-Bat. i. 313), "Incredibile dictu, quanta hujus vel foliorum magnitudine forma et textura, vel inflorescentia minus magisve racemosa sit varietas." Judging from the description only, *L. Perottetii*, A. DC., may well be referable to Thunberg's species also.

28. **Fraxinus Bungeana**, *DC.*? Ramis subtetragono-compressis, foliis petiolo 2–2½-pollicari pallido minute ferrugineo-punctato, foliolis unijugis cum impari coriaceis glabris opacis ovato-oblongis obtuse acuminatis obtuse serratis penninerviis et reticulato-venosis rete subtus præsertim elevato subtus oculo armato minute nigro-punctatis atque basin versus juxta costam ferrugineo-pilosis lateralibus brevissime petiolulatis basi obliquis 1½–2½ poll. longis 1½ poll. latis, terminali petiolulo circ. pollicari suffulto basi cuneato lamina 3–4½-pollicari 1½–2¼ poll. lata, racemis fructiferis in axillis superioribus solitariis vel 2–3nis plurifloris folio pluries brevioribus samaris 14–15 lin. longis 2 lin. tantum latis sub lente minute ferrugineo-punctatis linearibus compressis supra medium aliquantulum latioribus inde angustatis apice ipso obtusiusculo integro calyce brevissime 4-dentato cinctis.—In montosis juxta Peking collegit Dr. E. Bretschneider.

I do not feel satisfied that this is identical with Bunge's species, of which, so far as I am aware, only young specimens with ♂ flowers have been described, which may account for several discrepancies. It seems well-marked by its fruit, the upper third of which is narrower than the base, and the nut not at all elevated.

29. **Diospyros lotus**, *L.*

This shrub, recorded from the Peking mountains by Bunge, was met with by Mr. Sampson and myself in September 1866, unquestionably wild, in dense forests at the Tsing yune Pass, along the North River, about 120 miles from Canton. The only other localities where it is known to occur really indigenous are the Caucasian provinces, the Persian ones on the southern shores of the Caspian (Boiss. & Buhse, Aufz. Pfl. Transkauk. 146), and possibly the north of Asiatic Turkey. In the Dalmatian and Crimean stations it has probably subsisted from ancient cultivation; and Cæsalpinus, in the sixteenth century, speaks of it as an "arbor peregrina" in Italy.

30. **Erythræa pulchella**, *Fries.*—In campis humidis, Jehol, m. Aug. 1868, flf. invenit Rev. P. David.

Found by Karelin in Turkestan, and by Schrenck in Songoria, but not hitherto recorded from China, nor has it been met with in Manchuria or Mongolia.

31. **Cuscuta chinensis**, *Lam.*—In muris urbis Peking, in *Tribulo terrestri* parasitica, Aug. 1863; in incultis Pekinensibus, in *Hali-*

mocnemidis sp.?, et in *Lespedeza medicaginoide*, coll. Dr. S. W. Williams; in incultis, Cantone, in *Bidente chinensi*, Willd., præcipue parasiticam, legit Sampson.

The northern and southern specimens are precisely identical, and agree perfectly with the diagnosis in Engelmann's monograph, only known to me through Dr. Ascherson's Latin version. The styles are to some extent variable in length, and not always very appreciably unequal. Maximowicz does not record the plant from Peking.

32. **Solanum dulcamara**, *L.*—In mœniis metropoleos Peking, m. Aug. 1863, detexit Dr. S. W. Williams.

New to the Peking flora, and unknown in the neighbouring regions, where, however, the allied species or variety *S. persicum*, Willd., is met with.

33. **Veronica angustifolia**, *Fisch.*

A comparison with Peking specimens of this gathered by Dr. Williams, and Nagasaki ones from Oldham, distributed from Kew under n. 643, proves my *V. galactites* (Ann. Sc. Nat. 5e sér. v. 232) to be in no respect distinct. The extension of this plant into the extreme south-east of China is somewhat remarkable. The numerous forms referred to *V. paniculata*, L., require to be examined afresh.

34. **Orobanche ombrochares**, sp. nov. Caule simplici 8–9-pollicari sulcato penna olorina paulo crassiore basi imbricato-squamato ceterum squamas adpressas oblongas acutas circiter 5-lineales undique gerente inferne parce tomentello superne cum squamis superioribus bracteis sepalisque arachnoideo-tomentoso, floribus sessilibus in spicam densam multifloram ovalem 2–2½-pollicarem congestis, bractea ovato-lanceolata acuminata sepalis lanceolatis vix ad medium inæqualiter bifidis basi subliberis obscure 6–7-nerviis æquilonga, corolla vivide purpureo-violacea extus subarachnoideo-tomentosa intus glabra basi paulo ventricosa incurva 10 lin. longa calycem duplo superante fauce ampliata labiis æqualibus superiore integro inferiore trilobo lobis rotundatis erosis eciliatis, genitalibus inclusis, staminibus infra medium tubum insertis filamentis basi glanduloso-pilosis ceterum cum antheris (in sicco) albis apiculatis glabris, stylo glabro stigmate subquadrilobo ut videtur livido.—Juxta Peking a. 1868 leg. cl. Dr. S. W. Williams, quo teste, in tempestatibus pluviosis tantum viget. (Exsicc. n. 15872.)

Somewhat allied, unless I mistake, to *O. cruenta*, Bertol.: it is a most handsome species.

35. **Orobanche pycnostachya**, sp. nov. Caule simplici 8-pollicari

prominenti-anguloso pennæ anserinæ crassitie squamas sparsas oblongo-lineares acutiusculas erecto-patulas semipollicares gerente cum iis bracteis sepalisque pilis crispulis septatis glandulosis tomentoso, floribus sessilibus in spicam multifloram densissimam cylindricam 2–2½-pollicarem congestis, bractea lanceolata acuminata sepala oblongo-lanceolata vix ad medium æqualiter bifida lobis acuminatis plurinervia basi breviter connata fere duplo superante, corolla lutea tubulosa leviter incurva extus pilis capitatis consita intus glabra basi æquali sursum paulo ampliata 10 lin. longa sepalis duplo longiore labio superiore rotundato truncato integro medio mucronulato superiore paulo longiore trilobo lobis deltoideis omnibus crenulatis ciliatis, staminibus medio circiter tubo insertis corollæ æquilongis filamentis basi glanduloso-pilosis ceterum glabris, antheris in sicco luteolis inter se cohærentibus secus loculorum margines albobarbatis, stylo glanduloso-piloso stigmate exserto bilobo lobis crassis rotundatis piloso-glandulosis divergentibus.—In montibus ad occasum Peking sitis, m. Junio 1870 legit Dr. E. Bretschneider. (Exsicc. n. 17048.)

Allied to *O. ammophila*, C. A. M., which, however, has a much less compact spike, unequally lobed sepals nearly as long as the bract, and a violet corolla. An Amurian specimen of this, received from M. Maximowicz, has not "bracteæ florem æquantes," as described by Reuter.

36. Didymocarpus lanuginosa, *Wall.*—In montium rupibus Chinæ borealis, Aug. flf. leg. Rev. P. Arm. David.

Precisely similar to a specimen of Drs. Hooker and Thomson from tropical Khasia.

37. Elsholtzia Stauntoni, *Bth.* Ramis canescenti-tomentellis, foliis subtus pallidis crebre impresso-punctatis, verticillastris densis secundis, bracteis parvis ovato-lanceolatis calycibus griseo-canis impresso-punctatis subtriplo longioribus, corollis tomentosis ut videtur roseis.—Ad Nan kau, Chinæ septentrionalis, mense Septembri 1867 legit Dr. S. W. Williams.

38. Salvia (Plethiosphace) pogonocalyx, sp. nov. Caule erecto simplici pedali villoso, foliis inferioribus longius petiolatis cordato-ovatis superioribus sensim brevius petiolatis plerumque trisectis segmentis lateralibus terminali brevioribus plerumque imbricantibus obtusiusculis crenato-dentatis supra hirtulis subtus præcipue secus venas cum petiolo dense villoso-hirsutis, racemis terminalibus simplicibus rachi glanduloso-hirsutis, verticillastris 6–8-floris approximatis, bracteis parvis lanceolatis, pedicellis brevibus, calycibus campanulatis glanduloso-pilosis labio postico integro apicem versus glabro sordide purpureo antico longiore deorsum porrecto spinoso-bidentato intus medio annulo denso pilorum longorum alborum munitis, corollæ vio-

laceæ extus glanduloso-tomentellæ $\frac{3}{4}$-pollicaris tubo paulo ampliato intus exannulato labio superiore cymbiformi obtuso, genitalibus exsertis, staminum connectivis oblongis apicibus callosis acutis connatis. —Ad sinum Ta lien wan, Manchuriæ, Julio 1860 legit R. Swinhoe; in montibus ad occidentem urbis Peking sitis, Maio 1870, legit Dr. E. Bretschneider. (Exsicc. n. 6514.)

A handsome species, remarkable for the dense ring of long white hairs inside the calyx.

39. SCUTELLARIA GALERICULATA, *L.*—In temperatis prope Jehol, Junio flf. leg. Rev. P. David.

Precisely similar to some North-American specimens. Found sparingly in Manchuria, and also in the island of Sachalin, but not heretofore recorded as occurring in China proper.

40. RUMEX CRISPUS, *L.*—Peking, in arvis arenosis, Aug. 1869, legit Dr. S. W. Williams.

Not mentioned in Maximowicz's 'Index.'

41. CHENOPODIUM AMBROSIOIDES, *L.*—Ad vias prope Peking, Octobri 1860, coll. R. Swinhoe.

Not mentioned by Maximowicz.

42. ECHINOPSILON DIVARICATUS, *Kar. & Kir.*

Specimens of this curious plant, hitherto only found near the Saisang Lake in the Kirghiz steppes, were gathered, in September 1867, in dry places by the sides of fields, near Kalgan, close to the Great Wall. They agree in every respect with Moquin and Fenzl's diagnoses.

43. GIRARDINIA CUSPIDATA, *Wedd.*

This remarkable plant was met with in September 1867 on walls and rocks in the precipitous Nan-kau Pass, about thirty miles north of Peking, by Dr. Wells Williams. A specimen from him has the leaves rather rotundato-ovate (not unlike those of *Boehmeria longispica*, Steud.) than elliptic, and their acuminate apex not more than $1\frac{1}{2}$ instead of 3 to 5 millimètres long, as described; the lower leaves are also remarkably dwarfed. The "Mons Occ" locality, which Dr. Weddell seems to regard as a proper name, is unquestionably intended for "montes occidentales," the Si shan or Western Hills, a well-known summer resort of residents at Peking, and of great botanical interest.

44. PILEA PUMILA, *A. Gr.*

From Father David I have received a specimen of this, gathered in moist places in the mountainous region around Jehol. Although the occurrence of this plant in Manchuria was pointed out ten and eight years ago respectively by Maximowicz and Regel, the Asiatic habitat has been overlooked by Dr. Weddell, in the revision of his monograph for the 'Prodromus.' The specimens before me differ from American ones only in having smaller leaves.

45. **Corylus rostrata**, *Ait.*, γ. **mandshurica**, *A. DC.*?—In montibus ditionis Pekinensis, Apr.–Maio flf., Aug. fructibus immaturis onustam coll. Rev. A. David.

If this be really identical with the Amur plant, I should be disposed to regard it as specifically distinct from the American species. The male catkins are either solitary or geminate, the leaves more ovate in outline, and with more distinct and sharp lobules from above the middle, of a more ferruginous hue beneath, where also they are thickly studded with reddish granular glands. The fruits are collected in fours or fives; and the involucres, in my specimens only half an inch long, clothed with short spreading bristles, are less pannosely hairy than in typical *C. rostrata*, somewhat glandular, and obpyriform in shape; that is to say, there is no constriction, but they taper gradually to a point. The young nuts are deep-chestnut-coloured and compressed. I have, however, neither immature fruits of the American nor ripe ones of the Chinese plant for comparison.

46. **Pinus Bungeana**, *Zucc.* Foliis margine minutissime serrulatis, strobilis ad apices ramorum solitariis geminisve ramulo ipsis multo breviore suffultis erectiusculis ovoideis obtusis squamis acute et conspicue transverse carinatis apophysi subrhomboidea transverse compressa umbone centrali conspicue et rigide sursum uncinato.

As Fortune mentions having sent cones of this pine to England ten years ago, it is strange that Parlatore in his recent recension of Pinaceæ should have been unable to describe them, or to do more than copy Endlicher's character. The above brief supplementary description is drawn up from specimens with young cones, gathered by Dr. Williams from trees cultivated around temples in the neighbourhood of Peking. The bark of this remarkable tree, which separates in large thinnish flakes, is white outside, as if lime-washed, and inside of a pale fawn-colour marked all over with depressions, as if pricked with a pin. Endlicher gives "the tree of the nine dragons" as the Chinese name; but the characters attached to Dr. Williams's specimens, as representing its appellation in Peking, signify "white-fruited pine."

47. **Pinellia tuberifera**, *Ten.*—In agro Pekinensi, æstate 1866 coll. Dr. S. W. Williams.

I mention this to confirm Maximowicz's suspicion of its being Bunge's *Arum macrourum*. The Chinese specimens are identical with Japanese.

48. **Polygonatum chinense**, *Kth.*

Dr. Bretschneider, who has sent me a very good specimen of this from Peking, informs me that it is there cultivated as a medicinal plant. Kunth distinguishes this from the Nipalese *P. cirrifolium*, Royle, by its leaves being in fours not opposite ternate or senate, by its two-, not three-flowered peduncles, and its papillose filaments. But I find the leaves, with the exception of the two or three upper whorls, constantly in fives, the peduncles one- to four-, but generally three-flowered, and the filaments quite smooth, though looking sometimes papillose from the pollen-grains which have fallen from the anther-cells upon them. The species of *Polygonatum*, indeed, vary a good deal. Thus a specimen of *P. officinale* in my herbarium, from the Picentine Apennines, has the leaves 1¾ inch and flowers less than ½ inch long, whilst a plant of the same species gathered by the late Mr. Conolly, our Secretary of Legation at Peking, at Nikolajewsk, on the Amur, has leaves 6¼ inches and flowers 1⅛ inch long; and I have a Peking specimen in which one of the axils bears a four-flowered raceme! Hence, though I do not know the Indian plant, it appears permissible to doubt the distinctness of the Chinese one.

49. **Monochoria Korsakowii**, *Rgl. & Maack.*—In fossis circa Peking, Sept. 1866, coll. Dr. S. W. Williams.

Recorded hitherto only from Lake Kengka, in the Ussuri territory; but it is doubtless the plant mentioned in Maximowicz's 'Index Floræ Pekinensis' as a questionable variety of *M. vaginalis*, Pr. The species appears quite distinct; and my specimens agree well with both Regel's diagnosis and figure (Cent. Fl. Ussur. t. 12. ff. 1–7).

50. **Cyperus Monti**, *L. fil.*—In fossis agri Pekinensis, Octobri 1860, legit R. Swinhoe.

Found in Manchuria along the Ussuri, but not before recorded from China. The lower portion of the stem and the leaves are wanting; but the glumes, achene, and bifid style are quite the same as those of a Tyrolese specimen. I had carelessly, in the 'Adversaria,' referred this to *C. procerus*, Roth, which is, indeed, so extremely like, that in the dried state, at least, I do not see how the two can be distinguished, except by the achene and style. In this connexion it is singular, and perhaps suggestive, that Peking specimens of *Scirpus maritimus*, L., are apparently always distigmatic.

51. CYPERUS DIFFORMIS, *L.*—Circa Peking, 1869, collegit Dr. S. W. Williams.

Not mentioned in the 'Index Floræ Pekinensis.'

52. SCIRPUS MICHELIANUS, *L.*—Peking, 1869, legit Dr. Williams.

Not included by Maximowicz in the 'Index.'

53. CAREX SIDEROSTICTA, sp. nov. Radice e fibris numerosis longis pallide fuscis glabris contexta, culmis pedalibus strigoso-hirtis inferne vaginis subscariosis nervosis crebre ferrugineo-punctatis tectis, foliis omnibus radicalibus culmo dimidio brevioribus vel eum fere adæquantibus acutis parenchymate laxe celluloso plurinerviis margine minute serrulatis nervis setoso-hirtis 4–5 lin. latis, spicis circ. 5 androgynis basi fœmineis apice masculis inferioribus exserte superioribus subincluse pedunculatis, bracteis vaginantibus inflatis vix foliaceis glabris nervosis ferrugineo-punctatis, floribus inferioribus distantibus, perigyniis oblongis compressis viridibus longitudinaliter albido-nervosis glabris breviter et obtuse rostratis ore integro squama oblongo-lanceolata acuta trinervi extra nervos laterales late albo-marginata ferrugineo-punctata paulo brevioribus, achænio pallido elliptico trigono, stigmatibus 3 longis tomentosis.—In silvis montanis, Jehol, Aprili flf. invenit Rev. P. Arm. David. (Exsicc. n. 15599.)

Although I have devoted a good deal of time to the study of this plant, aided by the classical works of Schkuhr, Kunze, Drejer, Anderson, and the splendid 'Illustrations' of Dr. Boott, and have compared it with a considerable suite of specimens, I am not satisfied as to its position. It belongs to § 23 of Steudel's arrangement, which is merely an analytical clavis—and might, from the characters given, fall into either the fourteenth or twentieth of Kunth's classification. I suspect its affinity to be with the group to which *C. pedunculata*, Muhl., belongs, though it is not a near ally of that species. The genus, however, is so wonderfully rich in variety of types, and there is such divergence of opinion as to a natural arrangement amongst Caricologists, that it is most difficult, in many cases, to judge of the relationship of a sedge; and the excessive multiplication of subdivisions by Fries, Carey, and others in no small degree augments this difficulty. Drejer well observes (Symbol. Caricol. 16), "gregum in infinitum multiplicatio æque mala est et æque a naturali affinitate aliena ac in universali systemate ordinum vel familiarum vaga et nullo universali principio fundata dismembratio." So far as they are known to me by description or from specimens, the present plant does not appear nearly allied to any of the species described of late years from Manchuria, Japan, or Sachalin; but it may be the one alluded to in Maximowicz's 'Index Floræ Pekinensis' as "species ex androgynis." In general aspect, save for the absence of a terminal ♂ spike, it is not unlike *C. pilosa*, Scop., or *C. vaginata*, Tausch.

54. CAREX FABRI, sp. nov. Radice parce fibrosa, foliis radicalibus linearibus glabris margine carinaque minute serrulatis lineam latis culmo ¾-pedali glabro paulo brevioribus, spicis 5 androgynis basi fœmineis apice masculis densifloris 4–6 lin. longis exserte pedunculatis infima infra caulem medium sita superioribus sensim approximatis, bracteis arcte vaginantibus lineari-setaceis margine serrulatis caule multo brevioribus, perigyniis lenticulari-ovalibus rufo-castaneis valide costato-nervosis præsertim margine et rostro ipsius perigynii dimidiam longitudinem adæquante apice oblique bidentato scabris, squamis ovatis acutis rufo-castaneis nervo viridulo scabrido percursis vix ad rostri basin attingentibus, achænio rotundato-lenticulari stramineo lævi, stigmatibus duobus.—Juxta Shanghae legit Dr. C. Fabre-Tonnerre. (Exsicc. n. 10238.)

General Munro (who described my Chinese Cyperaceæ in 1857, for the 'Botany of the Voyage of the Herald') marked this in my herbarium as "allied to *C. vulgaris*, Fr., and *C. trinervis*, Degland." The former species belongs to the *Microrhynchæ* of Drejer; the latter falls under his *Trachychlænæ*, as does also the Chinese plant, which is evidently a near ally of *C. setigera*, Don (Drejer, Symb. Caricol. t. 8), and especially of the var. *minor* of that species, figured at plate 6 of Dr. Boott's 'Illustrations.' It is readily distinguished, however, by its strongly nerved perigynium, pale, smooth, lenticular nut, and two stigmas; the spikes, moreover, are androgynous.

55. LAPPAGO ALIENA, *Spr.*—In collibus a Peking occasum versus, æstatibus 1865–66 collegit Dr. S. W. Williams.

All the Peking specimens I have seen certainly belong to this species, and not to *L. racemosa*, Willd., which, however, is recorded by Bunge and Maximowicz.

56. HELOPUS VILLOSUS, *N. ab E.*—In rupestribus agri Pekinensis, Aug. 1866, parce vigentem detexit Dr. S. W. Williams.

Not before recorded from China proper, but found on the Lower Amur by Maximowicz. Dr. Williams's are undistinguishable from Japanese specimens.

57. **Chrysopogon pictus,** *Hance* (*Ann. Sc. Nat.* 5^e^ sér. v. 252).—In collibus ditionis Pekinensis legit Dr. S. W. Williams.

As remarked by me when describing this grass, it is naturally far more nearly allied to *Andropogon montanus*, Roxb., than to *Chrysopogon gryllus*, Trin., though it agrees technically with the latter in its spikes being reduced to the terminal articulation, by which character alone Mr. Bentham, in the 'Flora Hongkongensis,' distinguishes *Chrysopogon* from the § *Amphilophis* of *Andropogon*. It is evident that a distinction which breaks through natural affinities and which, moreover, is not constant (for depauperated spikes occur in many *Amphilophides*), cannot be adhered to; and there appears no alternative than either, with Steudel, to merge *Chrysopogon* in *Andropogon*, or, preferably, as it seems to me, to follow Prof. Grisebach, who, in his valuable paper 'Ueber die Gramineen Hochasiens,' transfers the *Amphilophides* to *Chrysopogon*. Dr. Williams's specimens agree well with De Grijs's from Fokien province and with others since found near Canton. The prevailing constituents of the Grass-flora of Peking would not lead us to expect the occurrence of such a tropical form as this from that neighbourhood.

58. **Crypsis aculeata,** *Ait.*—Peking, in arenosis, legit R. P. David.

Omitted from Maximowicz's 'Index,' nor has it been recorded from the neighbouring regions of the Asiatic continent, from Japan, or Sachalin, the interior of Siberia being the nearest known habitat.

59. **Calamagrostis brachytricha,** *Steud.*?—In collinis siccis et ad margines agrorum ditionis Pekinensis, æst. 1865 coll. Dr. S. W. Williams.

I have seen no authentic specimens; but mine agree perfectly with Steudel's character. The species has only, hitherto, been recorded from Japan.

60. **Stipa sibirica,** *Lam.*—In paradiso imperiali prope Peking, necnon ad Ku peh kau, juxta magnum murum, Aug.-Sept. 1866 coll. Dr. S. W. Williams.

Not previously recorded from Peking, where, however, the allied *S. Bungeana*, Trin., with beardless anther-cells, is found.

61. **Hierochloë dahurica,** *Trin.*—Circa Jehol, Maio flf. invenit Rev. P. David.

The only species hitherto recorded from Peking and neighbourhood is *H. Bungeana*, Trin., which I have been unsuccessful in procuring. Father David's plant is in every respect identical with specimens gathered on the Schilka by Maximowicz.

62. PAPPOPHORUM BOREALE, *Griseb.*—Ad vias prope Kalgan, prov. Chih li, m. Septembri 1867 collegit Dr. S. W. Williams.

Not before recorded from China proper. It is somewhat singular that this species—which was not found either by Schrenck or Semenow, is not enumerated in Prof. Grisebach's recension of the Gramineæ of Higher Central Asia (Göttinger Nachrichten, 1868), and had, indeed, I believe, only been met with in one or two localities in Siberia and Mongolia—should, according to Prof. Torrey (Rep. on Whipple's Exped. 99), be not uncomon in New Mexico. In like manner, the Siberian, Mongolian, Tien-shan, and Sikkim *Lasiagrostis mongholica*, Trin. and Rupr., has been found in the Rocky Mountains.

63. GYMNOGRAMME VESTITA, *Hook.*—In rupibus obumbratis circa Jehol, a. 1868 leg. Rev. A. David.

This fern has hitherto only been met with in Northern China and in the North-west Himalayas. Specimens in my herbarium from the latter locality agree well with those gathered by Father David.

64. CHEILANTHES KUHNII, *Milde.*—In montibus elatioribus umbrosis prope Peking, raram, Junio frf. invenit Rev. P. Arm. David.

This fern was confounded by me with *C. tenuifolia*, Sw. My solitary specimen is badly dried; but a reexamination, made at the suggestion of Dr. Kuhn, proves it, as he suspected, to belong to Milde's species. It is well characterized by the paleæ of the rhizome, and the stipitate glands of the frond. Dr. Kuhn seems to doubt its distinctness from *C. Dalhousiæ*, Hook., of which he had only seen a fragment, however, and had no means of comparing the two. The occurrence of *Gymnogramme vestita*, Hook., and *Adiantum Edgeworthii*, Hook., near Peking would rather favour this supposition; but my specimen is very unlike the figure given by Hooker of the Indian species (Spec. Fil. ii. t. 78 B) under the name of *C. dealbata.*

65. ATHYRIUM NIPONICUM (ASPLENIUM, *Mett.*).—Peking, ad margines rivulorum, in montosis, Julio frf. coll. Dr. S. W. Williams, Rev. A. David.

M. Maximowicz sends from Japan and littoral Manchuria a variety approaching *A. Goeringianum* by its rigidity of texture and aspidioid indusia. It is curious that a fern which extends from the extreme south of China, along the whole eastern seaboard into Manchuria and Japan, should have remained so long undetected. I am now quite satisfied by the arguments of Milde that *Athyrium* is a distinct group which cannot, without violence to nature, be associated with *Asplenium*.

66. **Asplenium varians**, *Wall.* (**Jehol, coll. Rev. P. A. David**), and, I have no doubt, a small specimen from Maximowicz (labelled "n. 46. *A. sepulchrale,* Hook.=*A. pekinense,* Hance. Nagasaki, rarius in muris vetustis, a. 1853") are referable to the same species. My *A. pekinense* is, I believe, quite distinct from this, as acknowledged by Mettenius and Kuhn, though Sir William Hooker and Mr. Baker have confounded the two. All the specimens I have received from Dr. Williams are precisely alike. A third species, gathered in Japan by Oldham, and distributed from Kew under the same name, is quite unlike in habit and dimensions. This M. Maximowicz has also sent me, ticketed:—"n. 45. *Asplenium furcatum,* Thbg.? nisi sp. nova=*A. sepulchrale,* Hook., teste spec. ex hb. Kew. *A. solidum,* Kze.? ex Baker Syn. Fil. p. 214, p. 454, ad *A. sepulchrale* amandatum? Cum *A. pekinensi* (*sepulchrali*) certissime non jungendum, jam statione et habitu. Ab *A. furcato* vero africano etiam diversissimum! In hortis *A. furcatum, A. præmorsum,* et *A. canariense* semper constantia. Nagasaki, 1863, in rupibus madidis umbrosis." This is doubtless the fern recently described by Dr. Kuhn (Linnæa, vol. xxxvi. p. 94) from Mettenius's manuscripts as *A. Wilfordii,* with the remark that it is allied to *A. laserpitiifolium.* It is clear that the name *A. sepulchrale* must be suppressed, as representing a "species collectiva."

67. **Aspidium craspedosorum**, *Maxim.*—**In silvis montanis humidis ditionis Pekinensis, Jehol, in rupibus umbratis, Julio frf. legit Rev. A. David.**

The Chinese specimens agree with the var. *mandshuricum* in the sharpness of the teeth and more distinctly auriculate pinnæ, but they have uniseriate sori as in the var. *japonicum.* My specimens, both Chinese and Manchurian, are, contrary to Maximowicz's diagnosis, larger than and with equally numerous pinnæ as the Japanese form, which I possess from both Veitch and Maximowicz. The plant has a remarkable resemblance to *Woodsia polystichoides,* Eaton.

68. **ASPIDIUM DRYOPTERIS** (**POLYPODIUM**, *L.*).—In silvaticis montanis ditionis Pekinensis, Junio frf. legit R. P. David.

Omitted from Maximowicz's 'Index,' and not recorded by Milde as occurring in China. After very careful consideration I am now convinced that the *Phegopterides* cannot either be retained amongst the *Polypodia* or kept distinct as a genus. There is no character, save the presence or absence of the indusium, to distinguish them; and the nearest allies of species of *Phegopteris* are often manifestly *Aspidia* rather than members of their own group near which they are systematically ranged; whilst ferns known for years from various localities only in an exindusiate state are found now and then to possess an indusium, instances of which are annually multiplying. Hence, whilst concurring with Braun, Fée, Mettenius, Grisebach, and others as to the affinities of these plants, I cannot even recognize them as forming a distinct section, as Prof. Braun has done, under the name of *Gymnodium*, but believe they should be intercalated amongst those *Aspidia* to which they are manifestly nearest; for I look on the absence of an indusium in these cases as merely a "nota accidentalis," and have no doubt this organ will be detected occasionally in all our European species if examined sufficiently young. If, having stated in print my inability to see how *Phegopteris* could be separated from *Polypodium*, I should be taxed with inconsistency for this decided change of opinion, I can only ask censors, in the words of Cicero (Epist. ad Attic. lib. xvi. ep. 7), to remember that "Nemo doctus umquam mutationem consilii inconstantiam dixit esse."

69. **ONOCLEA STRUTHIOPTERIS**, *Sw.*—In montanis prope Peking coll. Rev. P. Armandus David.

New to the Pekin flora, but occurs in Amuria, Sachalin, and perhaps also in Japan.

70. **CHARA CORONATA**, *Ziz.*, var. **BRAUNII**.—In collibus ditionis Pekinensis, Aug. 1860, raram inv. Dr. S. W. Williams.

Prof. Alex. Braun has kindly determined this for me.

Floræ Hongkongensis Supplementum. A compendious Supplement to Mr. BENTHAM'S Description of the Plants of the Island of Hongkong. By HENRY FLETCHER HANCE, Ph.D. &c. (Communicated by J. D. HOOKER, M.D., V.P.L.S., &c.)

[Read November 16, 1871.]

> "Emicuere rosæ violæque et molle cyperon;
> Albaque de viridi riserunt lilia prato."—PETRON. *Satyr.* 127.

RATHER more than ten years have elapsed since the publication of Mr. Bentham's 'Flora Hongkongensis,' the importance of which, to the student of the South-Asiatic flora, it would be difficult to overrate. Until it appeared, the only works available for consultation, except general systematic ones, such as the 'Prodromus' of DeCandolle and Kunth's 'Enumeratio,' were Loureiro's 'Flora Cochinchinensis,' Meyer's 'Observationes Botanicæ,' the 'Botany' of Beechey's Voyage, and that of H.M.S. 'Herald'—the last containing a tolerably complete list (but unfortunately little more than a list) of Hongkong plants, and the others being far too incomplete and unreliable for any useful purpose. To the above might be added Wight and Arnott's 'Prodromus Floræ peninsulæ Indiæ orientalis,' and Hooker and Thomson's 'Flora Indica;' but the former, remarkable for the judgment and ability with which it is composed, extends only, following the Candollean sequence, to Dipsacaceæ; whilst the second breaks off at Fumariaceæ, and can only be regarded as a specimen of what the authors would have desired to accomplish had entire leisure and the requisite Government support been at their disposal. Roxburgh's 'Flora Indica' has long been unprocurable. The 'Flora Indiæ Batavæ' of the late Prof. Miquel, published in five thick volumes from 1855 to 1861, is unquestionably an important contribution to botanical science; but it is far too much of a compilation, the characters being, for the most part, copied without alteration or examination from general systematic works; and there is too little critical spirit displayed in the limitation of the species (which are unreasonably multiplied) for it to be safely placed in the hands of unpractised botanists, who would be likely to acquire exaggerated ideas of the value of differences to which experienced students attach little weight. Mr. Bentham's book remains, in fact, at present, the most useful and complete of its kind; and while its comprehensive views admirably adapt it to train a young botanist judiciously and steer him clear of extreme opinions, the excellent plan adopted, of indicating the geographical range of each species, interests him in those problems of plant-distribution which are so intimately connected with the great and contested questions of the origin, dispersion, and variation of living organisms.

During the ten years that have passed by since its appearance, a number of species (representing rather more than 7 per cent., or one fourteenth of the actual number hitherto recorded) have been added to the flora; and the writer believes that he is performing a useful task in bringing these together in the form of a supplement, indicating, so far as he is able, their geographical distribution, noting at the same time such rectifications or changes of nomenclature in previously known species as subsequent researches have rendered necessary or desirable, and adding here and there critical or other observations of his own. In some instances he has ventured to express dissent from Mr. Bentham's views, assuredly not in any spirit of presumption, but because it is not always possible to relinquish one's own opinions in deference to any authority however high. Had the distinguished author himself had leisure to undertake this task, the writer would never have ventured on it; but the enormous labour involved in the preparation of the 'Genera Plantarum' and the 'Flora Australiensis' has for some years past entirely diverted Mr. Bentham's attention from Chinese botany. More than twenty years' constant study of the flora of the island and adjacent continent on the part of the writer may be held to confer on him some qualification; and the circumstance that almost every new plant detected in Southern China within the past ten years has been described by himself, rendering the citation of his own name frequently necessary, has given an unavoidably egotistical appearance to the following pages. Residing at a distance from any large centre of civilization, and deprived of the opportunity of consulting extensive libraries or obtaining the advice of more experienced botanists, he has necessarily laboured under many disadvantages; but he can conscientiously state that he has spared no pains to render the following enumeration as complete and trustworthy as possible; and he desires particularly to say that in no single instance has he quoted a botanical work on the authority of others, every reference, whether to text or plates, having been personally verified.

The species new to the flora of Hongkong enumerated in the following pages amount to 75, distributed under 59 genera, 24 of which were hitherto unrepresented. These species belong to 30 natural orders, as shown hereunder :—

2 to Ranunculaceæ.
1 „ Anonaceæ.
1 „ Brassicaceæ.
1 „ Capparidaceæ.
2 „ Bixaceæ.
1 „ Tiliaceæ.
2 „ Anacardiaceæ.
5 „ Lathyraceæ.
1 „ Rosaceæ.
1 „ Cucurbitaceæ.
1 „ Opuntiaceæ.
1 „ Araliaceæ.
1 „ Plumbaginaceæ.
1 „ Apocynaceæ.
5 „ Convolvulaceæ.

1 to Scrofulariaceæ.
1 „ Bignoniaceæ.
2 „ Polygonaceæ.
1 „ Euphorbiaceæ.
1 „ Corylaceæ.
1 „ Hydrocharidaceæ.
1 „ Zingiberaceæ.
5 „ Orchidaceæ.
1 „ Naiadaceæ.
1 „ Lemnaceæ.
1 „ Restiaceæ.
6 „ Cyperaceæ.
12 „ Agrostidaceæ.
14 „ Polypodiaceæ.
1 „ Lycopodiaceæ.

Opuntiaceæ, Bignoniaceæ, and Lemnaceæ are the only three orders now added to the flora. Convolvulaceæ are the family which, in proportion to extent, have received the greatest accession of species, 5 being added to the 13 recorded by Mr. Bentham; whilst the 75 ferns have been augmented by 14. It is, however, probable that the number of Polygonaceæ, here increased by 2 only, will be at least doubled. Something yet remains to be done for the perfect exploration of the island, the indigenous vegetation of which is unfortunately suffering greatly from the unchecked operations of woodcutters; and there is perhaps at present not one resident who takes any interest in botany. There is little doubt that with a few active and observant amateurs at work the number of grasses and Cyperaceæ (plants so generally overlooked by collectors) would be somewhat added to, though both Mr. Sampson and the writer have purposely paid much attention to these. Amongst Palms, there are at least three perfectly distinct *Calami*, which require to be studied when in fruit. On the whole, the additions now made do not affect the conclusions arrived at by Mr. Bentham or alter the statistical relations of the flora as stated by him. There is, however, good reason to believe that the affinity of the South-Chinese and Japanese floras is greater than he supposed. The writer has already stated elsewhere* his conviction that the indigenous vegetation of Hongkong, which owed its immunity from destruction to the former sparse population of the island, is identical with that once existing throughout the whole south of the empire, but of which, with the exception of herbaceous plants, only scanty vestiges now remain, owing to the avidity with which every woody plant is sought after and cut down for fuel. He hopes shortly to be able to give a list, with their respective habitats, of all the plants not included in the 'Flora Hongkongensis' or the present supplement, which, though not heretofore recorded as natives of China, have been met with by Mr. Sampson or others on the mainland in the province of Kwangtung, and which he has himself had occasion to examine and verify. With the data thus furnished, and the various contributions of the writer during the past nine years to the Paris 'Annales des Sciences Naturelles' and Dr. Seemann's 'Journal of Botany,' he believes it may be said that our knowledge of the South-Chinese flora and of its geographical relations will be scarcely, if at all, less complete than that which we possess of many parts of our East-Indian territories.

In the following pages those species actually added to the flora are numbered consecutively; the remainder, including those which, regarded as varieties by Mr. Bentham, are here assigned specific rank (e. g. *Scleria radula*) are here marked with an asterisk.

British Vice-Consulate,
Whampoa, 22 June, 1871.

1. **Ranunculus holophyllus,** *Hance in Ann. Sc. Nat. Par.* ser. 4, xv. 220.
Scarce, in moist cultivated ground. Allied to *R. sceleratus* Linn., and *R. micranthus*, Nutt.; agreeing with the former in its elongated heads of fruit, with the latter in its pubescence and slender pedicels. Not known from elsewhere.

2. **Ranunculus sceleratus,** *Linn.*; *Bab. Man. Brit. Bot.* ed. 6. 9.
Though I do not happen to have a Hongkong specimen of this by me at present, there is no doubt it is a native; and it is a common spring weed on the neighbouring continent in paddy-fields and kitchen-gardens. Spread over the whole of Europe, most parts of Temperate and some of Tropical Asia, Northern Africa, and North America; but not occurring in either Australia or New Zealand.

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* Seem. Journ. Bot. viii. 274.

***Tetracera sarmentosa,** *Willd.* (=Delima sarmentosa, *Linn.*; *Benth. Fl. Hongk.* 7).

There is not a single character to separate *Delima* from *Tetracera,* the Hongkong plant usually having several seeds, not one only. (Cfr. Planch. and Triana in 'Ann. Sc. Nat. Par.' ser. 4, xvii. 20. Hance in Seem. 'Journ. Bot.' vii. 115.)

***Artabotrys hongkongensis,** *Hance in Seem. Journ. Bot.* viii. 71. (= A. Blumei, *Hook. f. and Thoms. Fl. Ind.* i. 128, part.; *Benth. Fl. Hongk.* 10; but not *A. odoratissima,* Bl.)

Not hitherto found elsewhere.

3. **Melodori** sp.?

In the month of August 1861 I met in the woods at Hongkong with a small erect Anonaceous tree in fruit, about 15 feet high, with penninerved oblong leaves, densely clothed with stellate tomentum beneath, and also stellately pubescent above when young, but almost smooth at full maturity. The not ripe berries were ovoid, about an inch long, densely muricated with flattened tomentose cinnamon-coloured scales 3–4 lines long, dilated at the base, and not very unlike the cup-scales of *Quercus vallonea,* Kty.: one fruit which I dissected contained six oblong seeds. Mr. Bentham (who received a specimen) suggested, with all reserve, that it might prove to be a *Melodorum*; but until the flowers are discovered, its place in the order must remain quite uncertain, though there is little doubt it is new. M. Baillon (Monogr. des Anon. 211) makes *Melodorum* a section of *Unona.*

***Cocculus Thunbergii,** *DC. Prod.* i. 98.

Both *C. ovalifolius,* DC., and *C. trilobus,* DC., are reducible to this: Drs. Hooker and Thomson had already combined the two latter (Fl. Ind. i. 190), whilst Prof. Zuccarini (Fl. Jap. Fam. Nat. i. 189) regarded *C. trilobus* as a variety of *C. Thunbergii.* As there is a considerable amount of variation in form of leaf, the latter name is by far the most eligible.

***Cocculus incanus,** *Colebr.*; *Benth. and Hook. f. Gen. Plant.* i. 961. (= Pericampylus incanus, *Miers*; *Benth. Fl. Hongk.* 13.)

4. **Nasturtium benghalense,** *DC. Prod.* i. 139; *Hook. f. and Thoms. in Journ. Linn. Soc.* v. 139.

A weed in cultivated fields and fallows, flowering and fruiting at the close of the year. Widely diffused over India, and throughout the Indo-Chinese territories.

***Cardamine silvatica,** *Link*; *Koch, Syn. Fl. Germ.* ed. 3, i. 39.

All the specimens from Hongkong and Southern China I have examined belong to this, variously regarded as a species, or as a subspecies of the old *C. hirsuta*, Linn., by modern writers. I should judge them distinct; but I speak with the greatest diffidence, and Mr. H. C. Watson (Compend. Cyb. Brit. 483) appears to think differently.

5. **Capparis sciaphila,** *Hance in Ann. Sc. Nat. Par.* ser. 5, v. 206.

In a shady wood at Hongkong; gathered by me in August 1861. Found, as I learn from Mr. Bentham, in South China by Millett, but not known from elsewhere.

6. **Scolopia acuminata,** *Clos in Ann. Sc. Nat. Par.* ser. 4, viii. 251. (=Phoberos sævus, *Hance in Walp. Ann. Bot. Syst.* iii. 825.)

This species, which occurs also in Ceylon, and probably in the Indian peninsula, is confounded in the 'Flora Hongkongensis' with *S. chinensis,* Clos, from which, however, it is most unquestionably quite distinct, as I believe Mr. Bentham now fully acknowledges. Cfr. my 'Note sur deux espèces du genre Scolopia' (Ann. Sc. Nat. Par. ser. 4, xviii. 214). Though *sævus* is the oldest specific name (and my own), I do not take it up, because I think it a duty to protest against Art. 57 of the 'Lois de la nomenclature botanique' adopted by the Paris International Botanical Congress of 1867, as unreasonable, arbitrary, and productive of a wholly uncalled-for addition to the already overwhelming synonymy of the science.

7. **Xylosma senticosum,** *Hance in Seem. Journ. Bot.* vi. 328.

Once only gathered by me, in August 1861, by the side of the road leading up to Victoria Peak; and not hitherto found elsewhere.

***Waltheria indica,** *Linn.*; *W. and Arn. Prod. Fl. Penins.* i. 67. (= W. americana, *Linn.*; *Benth. Fl. Hongk.* 38.)

The word India being applied in Linnæus's time not only to the Caribbean islands, but to the continent of South America, the name I adopt is preferable for so widely diffused a plant; neither has priority.

8. **Grewia.**

About seventeen years ago I found, in the neighbourhood of Tai tam tuk, a small *white-flowered* species of this genus, very different from any known to me. Unfortunately it was mislaid after collection, and I never had any opportunity to examine it and determine its affinities.

***Triumfetta rhomboidea,** *Jacq.*; *Masters in Oliv. Fl. Trop. Afr.* i. 257. (=T. angulata, *Benth. Fl. Hongk.* 41, but not of *Lam.*)

According to Dr. Masters, Lamarck's plant is the same as *T. semitriloba*, L.

***Acronychia Cyminosma**, *Ferd. Müll. Fragm. Phytogr. Austr.* i. 27, not. (=Cyminosma pedunculata, *DC.*; *Benth. Fl. Hongk.* 60.)

***Vitis flexuosa**, *Thunb.*; *Miq. Ann. Mus. Bot. Lugd.-Bat.* i. 92. (=V. parvifolia, *Roxb.*, *Benth. Fl. Hongk.* 53.)

Thunberg's name has many years' priority, and must be adopted.

***Cardiospermum microcarpum**, *H., B., K.*; *DC. Prod.* i. 601; *Baker in Oliv. Fl. Trop. Afr.* i. 418. (=C. halicacabum, *Benth. Fl. Hongk.* 46, but not of *Linn.*)

This seems constant in the characters derived from the size and form of the capsule, and is apparently a good species. Mr. Baker refers to it the *C. halicacabum* of Harvey and Sonder's 'Flora Capensis;' but a Natal specimen in my herbarium, from Mr. MacOwan, belongs to the Linnæan species.

9. **Rhus semialata**, *Murr.*; *DC. Prod.* ii. 67.

On hill-sides, but not common. Flowers about October. A native of Japan, Formosa, and Eastern China, and recorded also from the Indian archipelago; but probably not really wild there. Though typical specimens of each look very different indeed, I am not satisfied of the distinctness of *R. hypoleuca*, Champ. The entire leaves, very hoary beneath, and dense ample panicles of the latter are the main points of distinction; but I have met with specimens which I felt had about equal claims to be referred to either species.

10. **Spondias mangifera**, *Pers.*; *W. and Arn. Prod. Fl. Penins.* i. 173; *Wight, Illustr.* i. t. 76. (=Evia amara, *Comm.*; *Blume, Mus. Bot. Lugd.-Bat.* i. 234, t. 41.)

In the thick woods at Hongkong; first gathered by me in fruit in November 1862, and again by Mr. Sampson in November 1868. Found also in the Indian peninsula, Ceylon, and the islands of the Malay archipelago.

11. **Millettia reticulata**, *Benth. in Plant. Jungh.* i. 249.

In the rocky bed of the stream near Tai tam tuk: gathered by the late Dr. Harland and myself, in June 1859. Found on the adjacent mainland by Millett, in the neighbourhood of Amoy by Fortune and myself, and in the island of Formosa by Swinhoe and Oldham, but not known from elsewhere.

12. **Smithia salsuginea,** *Hance in Seem. Journ. Bot.* vii. 164.

In a brackish swamp near the sea, on the peninsula of Kaulung, opposite Hongkong: discovered by Mr. Sampson in October 1868. Not known from elsewhere.

13. **Smithia conferta,** *Sm.*; *Benth. Fl. Austr.* ii. 228.

With the foregoing species. Occurs throughout the whole of continental India, in Ceylon, Java, the Moluccas, and Eastern tropical Australia.

14. **Geissaspis cristata,** *W. and Arn. Prod. Fl. Penins.* i. 218.

With the two preceding. Hitherto found only in Malabar.

***Pueraria Thunbergiana,** *Benth. in Journn. Linn. Soc.* ix. 122. (=Neustanthus chinensis, *Benth. Fl. Hongk.* 86.)

Found also in Japan.

***Pueraria phaseoloides,** *Benth. in Journ. Linn. Soc.* ix. 125. (=Neustanthus phaseoloides, *Benth. Fl. Hongk.* 86.)

15. **Adenanthera pavonina,** *Linn.*; *W. and Arn. Prod. Fl. Penins.* i. 271; *Wight, Illustr.* i. t. 80.

Not very uncommon in the Happy Valley and Hongkong woods, flowering in July. It also occurs on the adjacent continent, throughout the whole of tropical India, in Ceylon, and all the Malayan islands, and has become naturalized in the West Indies, where it was introduced.

***Albizzia Milletti,** *Benth.*

In the 'Genera Plantarum' (i. 596) "stipulæ setaceæ v. obsoletæ, v. rarius majores membranaceæ" are assigned to this genus; and in the 'Flora Hongkongensis' they are described as small and deciduous in the present species. My specimens, however, both from Hongkong and the neighbourhood of Canton, have stout stipular prickles.

16. **Pygeum phæostictum,** *Hance in Seem. Journ. Bot.* viii. 72.

Gathered in Hongkong by Mr. J. C. Bowring, but without any special record of locality. Occurs also in the neighbourhood of Canton, but is not at present known from elsewhere.

***Rosa microcarpa,** *Lindl.*; *DC. Prod.* ii. 601?

Though my specimen is only in fruit, I believe the Rose referred in the 'Flora Hongkongensis' to *R. multiflora*, Thunb., is this species. I have seen no rose at all like *R. multiflora* from this neighbourhood.

***Rhaphiolepis indica,** *Lindl.*

Being the same as *Opa Metrosideros* of Loureiro, Dr. Seemann proposes (Journ. Bot. i. 281) to revive this generic name, on the score of priority. But the other species of *Opa* described by Loureiro is a *Eugenia*, so that the proposed change, which would create four or five superfluous synonyms, is opposed to all sound principles of nomenclature, a genus composed of such heterogeneous elements having no claim to resuscitation.

***Kalanchoe pinnata,** *Pers.* (=Bryophyllum calycinum, *Salisb.*; *Benth. Fl. Hongk.* 127.)

Mr. Dalzell has described (Hook. Kew Journ. Bot. iv. 346), under the name of *Kalanchoe Ritchieana,* a plant which evidently renders necessary the suppression of *Bryophyllum.* This species has been accidentally overlooked by Drs. Hooker and Thomson in their recension of Indian Crassulaceæ (Journ. Linn. Soc. ii. 90).

***Altingia chinensis,** *Oliv. in Benth. and Hook. f. Gen. Plant.* i. 669. (=Liquidambar chinensis, *Champ.*; *Benth. Fl. Hongk.* 132.)

***Jambosa, Syzygium,** and **Acmena,**
recognized as genera in the 'Flora Hongkongensis,' are in the 'Genera Plantarum' (i. 718) reduced to *Eugenia*—the first as a separate section, the two latter to the section *Syzygium.*

***Melastoma repens,** *Desr.*,
which, with a few other species, constitutes the genus *Asterostoma* of the late Prof. Blume (Mus. Bot. Lugd.-Bat. i. 51), is transferred by Dr. Hooker in the 'Genera Plantarum' (i. 745) to *Osbeckia,* where DeCandolle had previously placed it. I have, however, shown (Seem. Journ. Bot. vii. 296) that this is a mistake, the plant agreeing in all characters both of flower and fruit with the genuine species of *Melastoma.*

***Barthea chinensis,** *Hook. f. in Benth. and Hook. f. Gen. Plant.* i. 751. (=Dissochæta Barthei, *Hance in Benth. Fl. Hongk.* 115.)

***Blastus cochinchinensis,** *Lour. Fl. Cochinch.* ed. *Willd.* ii. 643; *Seem. Journ. Bot.* i. 281; *Hook. f. in Benth. and Hook. f. Gen. Plant.* i. 752. (=Anplectrum parviflorum, *Benth. Fl. Hongk.* 116.)

***Blastus Hindsii,** *mihi.* (=Oxyspora? pauciflora, *Benth. Fl. Hongk.* 116.)

As this has ample, lax, many-flowered panicles (in some fine specimens gathered by me, in September 1866, in the forest at the Tsing-yune pass, in the province of Kwang tung, they were frequently above a foot in length), whilst the preceding has the blossoms disposed in small axillary 3–6-flowered clusters, the adoption of Mr. Bentham's specific name would involve an absurd contradiction of fact. I therefore propose to call the species after its discoverer, the late Mr. R. B. Hinds, surgeon of H.M.S. 'Sulphur,' the first collector of plants in the island. The character assigned by Dr. Hooker in the 'Genera Plantarum' to the inflorescence of this genus requires amendment, in order to include the present species.

***Zehneria umbellata**, *Thw. Enum. Pl. Zeyl.* 125; *Benth. and Hook. f. Gen. Plant.* i. 830. (=Karivia umbellata, *Arn.*, *Benth. Fl. Hongk.* 124.)

17. **Melothria indica**, *Lour. Fl. Cochinch.* ed. *Willd.* i. 43; *Naud. in Ann. Sc. Nat. Par.* ser. 4, xvi. 169, t. 2. (=Æchmandra indica, *Arn.*; *M. J. Roem. Syn. Peponif.* 32.)

On hill-sides, scrambling amongst grass, and in waste places, climbing over thickets. Found also on the Indian continent, in Ceylon, Cochinchina, the Chinese mainland, and the Moluccas.

***Rhynchocarpa odorata**, *Hook. f. in Benth. and Hook. f. Gen. Plant.* i. 831. (=Æchmandra odorata, *Hook. f. and Thoms.*; *Benth. Fl. Hongk.* 124.)

18. **Opuntia Dillenii**, *Haw.*; *W. and Ann. Prod. Fl. Penins.* i. 363; *Pfeiff. Enum. Cact.* 162; *Wight, Illustr.* ii. t. 114.

In thickets, among rocks by the sea, at Sheko; flowering in December. Found by the late Dr. Harland and myself. Spread over many parts of Southern Asia; but no doubt a native originally of tropical America.

19. **Acanthopanax aculeata** †, *Seem. Journ. Bot.* v. 238; *Benth. and Hook. f. Gen. Plant.* i. 939.

† Miquel and Seemann make *Panax* neuter; Mr. Bentham made it feminine in the 'Flora Hongkongensis,' but in the 'Genera' and the 'Flora Australiensis' masculine; and Dr. F. v. Mueller observes (Fragm. Phytogr. Austr. iv. 122), "Panacis genus apud Plinium est generis masculini." It would perhaps be difficult to prove this. *Panaces* is certainly neuter in Pliny. "Panaces . . . . diis inventoribus adscriptum" (Hist. Nat. xxv. 11); and, unless I am mistaken, *Panax* nowhere occurs in Pliny in such a connexion as to show its gender. He in one place (xxvi. 58) has the words "panace poto;" but the first may just as well be the ablative of *panaces* as of *panax*, and it is impossible to tell whether the adjective be masculine or neuter. On the other hand, both the names of plants, and substantives of the third declension ending in *ax* are, as a rule, feminine. Forcellini, however, makes the word masculine; but Liddell and Scott mark πάναξ as doubtfully so.

[*Panax* is feminine in Pliny: "Aliqui et hanc panacem heracleon, alii sideritim et apud nos millefolium vocant, cubitali scapo, ramosam, minutioribus quam fœniculi foliis vestitam ab imo."—*Hist. Nat.* xxv. cap. v. s. 19. Vol. iv. p. 117, Sillig's edition.—SEC. L. S.]

In woods and thickets. Common on the adjacent mainland, extending at least as far north as Amoy and to the Island of Formosa, and found also in Khasia and Assam.

***Heptapleurum octophyllum,** *Benth. in Benth. and Hook. f. Gen. Plant.* i. 942. (=Paratropia cantoniensis, *Hook. and Arn.*; *Benth. Fl. Hongk.* 136.)

***Cornus kousa,** *Buerg. herb., teste Miq. Ann. Mus. Bot. Lugd.-Bat.* ii. 159. (=Benthamia japonica, *Sieb. and Zucc.*; *Benth. Fl. Hongk.* 138.)

The reduction of *Benthamia* to *Cornus*, effected by Dr. Hooker in the 'Genera,' had been already indicated as imperative by Prof. Asa Gray (Mem. Amer. Acad. n. s. vi. 392). For the sake of conformity to the nomenclature of Endlicher, the section to which the Hongkong and Japanese species and its Himalayan relative belong might be named *Cephalocrania*. I may here remark that it is by inadvertence that *C. officinalis*, Sieb. and Zucc., figured at plate 50 of the 'Flora Japonica,' is referred in the 'Genera' to *Tanycrania*; as that section was limited by Endlicher, it fell into it, and was rightly so cited by him (Gen. Plant. Suppl. i. 1415); but it belongs to Dr. Hooker's fourth section, for which I would propose the name *Chrysocrania*.

***Oldenlandia.**

This genus, including the sections *Anotis*, *Houstonia*, *Scleromitrion*, and *Kohautia* (the two latter of which he had before thought of generic rank), was admitted by Mr. Bentham in the 'Flora Hongkongensis;' but in the 'Flora Australiensis' he recombines it with *Hedyotis*. Prof. Asa Gray, on the other hand (Man. Bot. N. Un. St. ed. 5, 211), considers both *Oldenlandia* and *Houstonia* well-marked genera; and I think the very peculiar shape and small number of the seeds of the latter may justify its retention. To this latter group belong *Hedyotis Rheedei*, W. & A., *H. monosperma*, W. & A., *H. Thwaitesiana*, Hance, *H. boerhaavioides*, Hance, and other Asiatic species.

***Ophiorrhiza japonica,** *Blume*; *Sieb. and Zucc. Fl. Jap. Fam. Nat.* ii. 177. (=O. Eyrei, *Champ.*; *Benth. Fl. Hongk.* 147.)

***Webera corymbosa,** *Willd.*; *Roxb. Fl. Ind.* i. 696. (=Stylocoryne Webera, *A. Rich.*; *Benth. Fl. Hongk.* 156.)

Dr. Hooker informs me (in litt.) that there are two plants under this name in the 'Flora Hongkongensis,' with very different seeds.

***Webera mollissima,** *Benth. msc.* (=Stylocoryne mollissima, *Walp.*; *Benth. Fl. Hongk.* 156.)

The genus *Stylocoryne*, Cav., is identical with *Randia*, L., not with *Webera*, Schreb.

***Ixora Pavetta**, Roxb.; Benth. Fl. Austr.* iii. 414. (=Pavetta indica, *Linn.; Benth. Fl. Hongk.* 157.)

It seems impossible to keep *Pavetta* apart from *Ixora*; and their junction, proposed by various writers, is now acquiesced in by Mr. Bentham. Miquel, who unites the two, prefers the name *Pavetta*, assigning as a reason (Fl. Ind. Bat. ii. 263) that it is "nomen certioribus speciebus stabilitum et perfectioris quasi organisationis antistes"—which is evidently a mere fancy. But Asa Gray well observes ('Notes upon some Rubiaceæ,' 7) that *Ixora* ought to be retained, " not only because it had been preferred by Lamarck [and he might have added Roxburgh], but also because, as a Linnæan genus, it is ten years older than *Pavetta*, appearing in the first edition of the 'Genera Plantarum.'"

***Ixora stricta**, *Roxb.*, is, I think, a doubtful native.

Mr. Fortune, in his 'Narrative of Two Visits to the Tea Countries of China,' no doubt alluding to this species, speaks of "*Ixora coccinea* flowering in profusion in the clefts of the rocks" at Hongkong; but this is a pure flight of imagination. The form found at East Point has pink blossoms; but the wild plant, which is singularly abundant at Whampoa and many other places near Canton, has the flowers invariably of a bright flame-colour, or deep orange verging on scarlet. Hence I suspect that the Hongkong plant, which is quite local, growing only behind a single temple, is an introduction.

***Eupatorium Wallichii**, *DC.*?

Specimens of this from Whampoa (which are precisely similar to Harland's Hongkong ones) are, Mr. Bentham wrote me some years ago, different from the true plant of DeCandolle (and they look so when compared with a Khasia specimen of Hooker and Thomson's, which has a denser inflorescence and less obtuse involucral bracts); and he thinks the South-Chinese plant nearest *E. longicaule*, DC., the involucral bracts of which, however, are much broader. The leaves of our species are ovate or ovate-lanceolate and crenato-serrate, usually rounded, but sometimes cuneately narrowed at the base. *Cfr.* Miquel, Ann. Mus. Bot. Lugd. Bat. ii. 167, who refers the Indian plant to *E. japonicum*, Thunb.

***Boltonia indica**, *Benth.*

This occurs in two well-marked forms, which I have thus distinguished (Ann. Sc. Nat. Par. ser. 5, v. 219):—" *α. collina*; branching; stem downy; leaves small, rigid, roughly hairy and downy; flowering branches several; ligules scarcely longer than than the disk. *Asteromaea indica*, Blume; DC. Prod. v. 303. On hill-sides, grassy hillocks, graves, &c. *β. rivularis*; simpler; stem smoothish; leaves larger, flaccid, downy or nearly smooth; flowering branches few; ligules frequently one and a half times as long as the diameter of the disk; scales of the pappus less developed than in the last variety. *Hisutsua cantoniensis*, DC., Prod. vi. 44. On the banks of rivers and streams, along canals, in ditches, invariably growing in mud." I have always found the pappus-scales laciniate in this plant.

***Aster striatus**, *Champ.*

According to Miquel (Ann. Mus. Bot. Ludg.-Bat. iii. 197), the Japanese *Calimeris ciliata*, A. Gr., mentioned by Bentham as a spurious *Calimeris* is identical with this. If so, it is certainly no *Calimeris* as that group (which I concur with Mr. Bentham in regarding as identical with *Boltonia* †) was defined by Cassini, and by Torrey and Gray in the 'Flora of North America,' but a true *Aster*, belonging to the section named *Asteromeris* by Turczaninow, and *Orthomeris* by Torrey and Gray. The allied genus, *Heteropappus*, Less., intermediate between *Boltonia* and *Aster*, reduced to *Calimeris* by Asa Gray, but which is quite as well characterized as the majority of Astereous genera, is represented on the adjacent mainland by *H. Sampsoni*, Hance, which may possibly occur in Hongkong.

***Aster trinervius**, *Roxb.*

In the living plant the pappus is either pure white or dull grey; but in the herbarium it turns of a salmon-colour, like that of *Pyrrhopappus* or *Gerbera*.

***Conyza japonica**, *Less.*; *DC. Prod.* v. 382. (=C. veronicifolia, *Wall.*; *Benth. Fl. Hongk.* 176.)

***Blumea.**

I am distinctly of opinion that there are more than six species of this genus in Hongkong; and, as I have before observed (Seem. Journ. Bot. vi. 174), many forms seem to hold to their characters of aspect, stature, shape of leaves, and odour (which latter varies much, some species or varieties being delicately aromatic, others disagreeably rank) quite constantly. It would, however, be impossible, without a thorough review of the species usually acknowledged, and a comparison of copious suites of specimens from various parts of the world, together with authentic types, to determine the number, limits, and nomenclature of these; and I therefore confine myself, *ex rei necessitate*, to this statement. It is but fair to add that my views as to the limits of species, or their legitimacy, would doubtless often be repudiated by Mr. Bentham; but I speak after prolonged observation of these plants (in a wild state) growing under precisely similar circumstances and in the same soils.

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† *C. integrifolia*, Turcz., implicitly excluded by Mr. Bentham, indubitably belongs here.

***Wedelia biflora**, *DC. in Wight's Contrib. Ind. Bot.* 18; *Benth. Fl. Austr.* iii. 539. (=Wollastonia biflora, *DC.*; *Benth. Fl. Hongk.* 183.)

The species of *Wollastonia* vary so much as regards entire absence of pappus, or its presence in the shape of a few deciduous bristles, that it is found impossible to retain the genus. I have also seen achenes of *Wedelia calendulacea*, Less., entirely without pappus.

***Saussurea pulchella**, *Fisch.*, ε. japonica, *v. Herder in Plant. Radd. Monopet.* 51. (=S. japonica, *DC.*; *Benth. Fl. Hongk.* 167.)

Herr v. Herder has, I think, acted with great judgment in reducing this and many other usually received species to the rank of varieties. I had long been satisfied that no specific difference exists between the Hongkong and Amoy plant and Amurian specimens of the pinnatifid form which is the type of *S. pulchella*.

***Ixeris ramosissima**, *A. Gr.*

Under this name, I am inclined to think, two species are confounded—one a large branching plant, with large runcinate and lyrate leaves narrowed into a petiole, the other with small scarcely divided stem-clasping leaves, which is near *I. sonchifolia*, mihi (*Youngia*, Maxim.); but the specimens at hand are not sufficient to enable me to characterize them satisfactorily. Prof. Asa Gray remarks of his *I. stolonifera* (Mem. Amer. Acad. vi. 397) that it is "doubtless the *Youngia pygmæa* of Ledebour and Zuccarini, as to their Japan plant, but not a congener of *Prenanthes pygmæa*, Ledeb. (*Crepis nana* of Richardson), which is apparently a *Crepis*." But this is too hasty an identification.

Zuccarini expressly says of his plant (Fl. Jap. Fam. Nat. ii. 194), "Exemplare aus der Gegend von Ochozk† und aus dem östlichen Sibirien waren mit den japanischen vollkommen übereinstimmend." Moreover I have received from M. Maximowicz, under the name of *Youngia pygmæa*, Zucc., a plant gathered in fallow ricefields at Nagasaki (and not enumerated in Miquel's 'Prolusio Floræ Japonicæ'), which I refer, without the slightest hesitation, to *Youngia pygmæa*, *δ. lyrata*, of Ledebour's 'Flora Rossica.' It has 10-striate linear-lanceolate achenes, completely erostrate, and scarcely even narrowed at the apex, which is crowned by a thickened disk; the dried flowers are of a pale and dirty purplish hue. This is no doubt identical with *Crepis nana*, Richards.; but, as remarked by Torrey and Gray (Fl. N. Amer. ii. 488), it has nothing to do with *Barkhausia*, to which it was referred by DeCandolle and Turczaninow. *Ixeris stolonifera*, A. Gr., has an exceedingly long, delicate, thread-like beak to the fruit.

***Scævola Kœnigii**, *Vahl*; *Benth. Fl. Austr.* iv. 86. (=S. Lobelia, *De Vr.*; *Benth. Fl. Hongk.* 198.)

Mr. Bentham has shown that Linnæus never called this species *S. Lobelia*; the name now adopted is the oldest.

***Lobelia.**

I believe *L. trigona*, Roxb., and *L. affinis*, Wall., to be distinct species; and they are so regarded by Drs. Hooker and Thomson, in the 'Præcursores ad Floram Indicam' (Journ. Linn. Soc. ii. 27). The former is, as described by Roxburgh, an erect branching plant, sometimes slightly creeping at the base, and with broad, ovate, subsessile or sessile leaves, and glabrous pedicels and calyx-tube; it grows always, I believe, in moist grassy places, and is not, that I am aware, a native of Hongkong or Southern China. *L. affinis* has a quite different habit; it shows no disposition whatever to grow upright, but creeps extensively, throwing out rootlets at intervals; the leaves are conspicuously stalked, usually larger and wider than those of the last, somewhat deltoid in outline, and more or less pubescent; the pedicels and calyx-tube are pilose, the latter in fruit somewhat less distinctly ribbed. This I have found always in sheltered places, often growing on steep sides of ravines, or in small glens. The two species are, as stated by Drs. Hooker and Thomson, often confounded; and my specimen of Dr. Thwaites's n. 1776, quoted by them under *L. affinis*, is certainly referable to *L. trigona*. *L. chinensis*, Lour., grows in half-dried ricefields, or in damp grassy plains, and is very abundant around Canton. It is perfectly glabrous, and nearest *L. trigona*, but differs by its almost or quite simple stem, sessile, oblong, or elliptic, entire, or slightly denticulate leaves, much like those of *L. anceps*, Thunb. It is also of a deeper tint, and the upper leaves, terminal portion of the stem, pedicels, and calyx are most frequently of a purple tint. Loureiro describes it as procumbent or creeping; but, though I have observed it for years, I have never seen a specimen otherwise than quite strict and erect, like a *Striga*.

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† I do not find the species recorded in Trautvetter and Meyer's 'Florula Ochotensis,' nor yet in Regel and Tiling's 'Florula Ajanensis.'

***Rhododendron ovatum**, *Pl.*; *ex Maxim. in Mél. Biolog. Bull. Acad. Sc. Pétersb.* vii. 338. (=Azalea ovata, *Lindl.*; *Benth. Fl. Hongk.* 201.)

***Rhododendron indicum**, *Sweet.* (=Azalea indica, *Linn.*; *Benth. Fl. Hongk.* 201.)

***Rhododendron Farreræ**, *Tate*; *DC. Prod.* vii. 725. (=Azalea squamata, *Lindl.*; *Benth. Fl. Hongk.* 201.)

The form and regularity or degree of irregularity of the corolla, the number of stamens, and the persistence or deciduousness of the foliage are so variously combined in different species, and there are besides some with only half-deciduous or nearly persistent leaves, that it appears quite impossible to admit the genus *Azalea* as circumscribed by Mr. Bentham and other botanists. *Rhododendron* as limited by G. Don (including *Rhodora* and *Osmothamnus*), seems to form a far more natural group. The genus, indeed, is in much the same case as *Vaccinium*, *Arbutus*, *Thibaudia*, *Andromeda*, and other members of the family, which comprehend a variety of types linked to each other by different gradations, so that there seem no alternatives than either to regard each genus as a whole divided into a number of sections, or else to raise each of these to generic rank. The name *Azalea* should be reserved for the plant named *Loiseleuria* by Desvaux, and *Chamæledon* by Link, which, as long ago observed by Hooker and Arnott, and Babington, is the original *Azalea* of Linnæus (and therefore of course the type of the genus), and the only one to which the name is applicable †.

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† Since the above was written, I have received, through the kindness of the author, M. Maximowicz's important memoir 'Rhododendreæ Asiæ orientalis,' published at St. Petersburg in 1870. The author conclusively shows that

***Statice.**

S. bicolor, Bunge, to which Mr. Bentham suspected *S. sinensis* to be referable, seems to me to differ in many respects. A plant also from Loochoo, gathered by Mr. Charles Wright, is, I think, a distinct species, intermediate between *S. sinensis*, Gir., and *S. japonica* †, S. & Z., which I have described (Ann. Sc. Nat. Par. ser. 5, v. 236) under the name of *S. Wrightii.*

20. **Plumbago zeylanica,** *Linn.*; *Boiss. in DC. Prod.* xii. 692.

Not uncommon, in waste places and hedges, on the south side of the island, and abundant in the neighbourhood of Stanley. A common weed in many places on the mainland, extending throughout the tropical regions of Asia and Africa, the Cape-Verdes, Northern and Eastern Australia, and several of the Polynesian islands.

***Mæsa Doræna,** *Blume,* β. **coriacea,** *Hance in Ann. Sc. Nat. Par,* ser. 5, v. 225. (=Mæsa coriacea, *Champ.*; *Benth. Fl. Hongk.* 204.)

Not in any way distinguishable as a species from the Japanese type, which is found in Fokien province.

***Ardisia punctata,** *Lindl.,*

though not differing from *A. crispa,* A. DC., as stated in the 'Flora Hongkongensis,' by obtuse calyx-lobes (for they are often quite acute), is very different in habit and especially in inflorescence. I believe the Hongkong plant named *A. crispa* to belong to A. DeCandolle's variety β. *elegans*; and I do not think *A. divergens,* Roxb., is specifically different. *Cfr.* 'Ann. Sc. Nat. Par.' ser. 5, v. 226.

***Symplocos microcarpa,** *Champ.*

I have little doubt that this, of which I have only seen a single specimen, is referable to *S. lancifolia,* S. & Z. Beyond leaves

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neither the *Azaleas* of modern writers, *Rhodora,* nor *Osmothamnus,* can be maintained as genera, but he still retains the name of *Loiseleuria* for the European plant. The identification of *Azalea squamata* with *Rhododendron Farreræ,* which I have taken from this memoir, I had myself arrived at, from the characters given in the 'Prodromus,' as far back as 1845, and written on my own herbarium ticket; but I subsequently supposed it impossible that Prof. Lindley, who was so intimately connected with horticulture, could have described as new a species which he must have seen in cultivation years before, and which had been figured by Sweet.

† This, Mr. Bentham (Fl. Austr. iv. 267) reduces to *S. australis,* Spr., and he does not think *S. sinensis* will prove distinct.

somewhat broader at the base and quite simple racemes, I can detect no difference; and the leaves of the Japanese plant are somewhat variable, and the racemes not always branched. Moreover *S. lancifolia* grows on the White-Cloud Hills above Canton.

21. **Parechites Bowringii,** *Hance in Seem. Journ. Bot.* vi. 299.

Gathered by Mr. J. C. Bowring in Hongkong, and not known from elsewhere. By an error of the printer in omitting the numeral 4 before *pollicaribus* in the diagnosis, I am made to describe the follicles as only 1 inch instead of 4 inches long, as is really the case.

***Parechites Thunbergii,** *A. Gray in Mem. Amer. Acad.* vi. 402. (= Rhynchospermum jasminoides, *Lindl.*; *Benth. Fl. Hongk.* 221.)

The seeds both of the preceding, as described by me, and of this, as observed by Miquel (Ann. Mus. Bot. Lugd.-Bat. ii. 130) and Oliver (Journ. Linn. Soc. ix. 166), having a sessile coma, it is clear that neither is a *Rhynchospermum*; besides which, as I pointed out when describing my *P. adnascens*, A. DeCandolle's genus *Rhynchospermum* was published eighteen years later than that of Reinwardt, and cannot stand. Nor is this affected by the identity of this latter—suspected by Miquel and established by Oliver—with Lessing's *Leptocoma*, over which Reinwardt's genus has five or six years' priority.

***Buddleia.**

B. asiatica, Lour., and *B. Neemda*, Ham., according to the observations of Mr. Sampson and myself, preserve in Southern China their characters quite clearly, and show no disposition to run together. The latter is by far the more common of the two; and its flowers exhale a most powerful scent of honey, which I do not think is the case with the other plant.

22. **Ipomœa paniculata,** *R. Br.*; *Benth. Fl. Austr.* iv. 414.

In woods and thickets, but not very common. Diffused throughout the tropics of the whole world. The seeds have a large dense tuft of dirty white wool springing from the apex, longer than themselves, and enveloping them in the fruit; but the rest of the surface is smooth. In the specimens examined by me I have always found the ovary simply 2-celled, without spurious septa as in *Batatas*; but Dr. Wight figures it (Madras Journ. of Lit. and Sc. v. t. 11) as completely 4-celled. Prof. Grisebach (Fl. Br. W. Ind. 469) refers this to the obscure *I. digitata*, L.

23. **Ipomœa tuberculata,** *Roem. and Schult.*; *Choisy in DC. Prod.* ix. 386.

Now spread more or less over the island, flowering during the whole year. Scattered throughout all the warmer regions of the globe. Seeds with a close cinereous pubescence, and besides with long brownish-white wool, forming a beard along the two lateral angles. I am very doubtful whether this is really indigenous; for I know of no plant which grows so rapidly and spreads over such an enormous space. When once it has obtained a footing in a garden it is almost impossible to eradicate it; and its embraces are fatal to many trees and shrubs. The old stems are wonderfully tenacious, and would make admirable ropes for packing cotton and other merchandise. Mr. Bentham (Fl. Austr. iv. 415) refers this to *I. palmata*, Forsk.; but I do not adopt the name, because there is a good deal of obscurity about this and allied species. Moreover Mr. Bentham includes under this name *I. pulchella*, Roth, which, to judge from Kotschy's Kordofan specimens (Iter Nub. n. 177), is surely, as remarked by Grisebach (Fl. Br. W. Ind. 470), quite distinct.

24. **Ipomœa obscura,** *Ker*; *Choisy in DC. Prod.* ix. 370.

On grassy hill-sides near the sea in the neighbourhood of Aberdeen; first gathered by me in May 1858. Occurs throughout Tropical Asia, continental and insular, in Abyssinia, and in Queensland.

***Ipomœa angustifolia,** *Jacq.*; *Benth. in Fl. Austr.* iv. 425. (=I. filicaulis, *Blume*; *Benth. Fl. Hongk.* 238.)

Dr. Thwaites (Enum. Pl. Zeyl. 211) refers this to *I. tridentata*, Roth.

25. **Ipomœa sinuata,** *Ortega*; *Choisy in DC. Prod.* ix. 362.

Amongst grass and in hedges. Extends from the Southern United States, throughout the whole of Tropical South America, and the West-India Islands—and is also found in various parts of the Old World, though perhaps not really wild there.

26. **Ipomœa involucrata,** *Beauv.*; *Miq. Fl. Ind. Bat.* ii. 609. (=I. pileata, *Roxb. Fl. Ind.* i. 504.)

On the grassy hill-side about halfway up to Victoria Peak; found only once, by Mr. C. Alabaster in October 1856. Common on the west coast of Africa, and occurs also in Madagascar, Java, and India; but Roxburgh says it was introduced into Calcutta from China.

***Solanum biflorum**, *Lour.*; *Miq. Ann. Mus. Bot. Lugd-Bat.* iii. 118. (=S. decemdentatum, *Roxb.*; *Benth. Fl. Hongk.* 242.)

Though Loureiro's name is not a very good one, the rules of botanical nomenclature imperatively require its retention†.

***Solanum Wrightii**, *Benth.*

This very fine species, which forms an erect tree about 15 feet high, is certainly not a native of Hongkong. I remember being told many years ago that it was introduced from New Zealand under the name of "Potato tree." If so, it must have been from some garden, as no such species is known from the Pacific isles. It is curious that the native country of one of the handsomest species of the genus should be quite unknown.

***Adenosma grandiflora**, *Benth. msc.* (=**Pterostigma grandiflorum**, *Benth. Fl. Hongk.* 247.)

***Adenosma capitata**, *Benth. msc.* (= **Pterostigma capitatum**, *Benth. Fl. Hongk.* 248.)

Mr. Bentham has shown (Fl. Austr. iv. 486) that R. Brown's genus *Adenosma* is the same as *Pterostigma*, and that it was owing to an error of A. Cunningham's that he had supposed it to be reducible to *Stemodia*. Nees von Esenbeck's homonymous acanthaceous genus will have to be called by Hamilton's name of *Cardanthera*, or, as it would more properly be written, *Cardianthera*.

***Herpestis Monnieria**, *H., B., K.*

The flowers of this are always described as pale blue, verging on white. As the plant occurs here, the corolla-tube is always yellow within and marked with a deep rose-coloured incomplete ring at the throat, and the limb is quite white. I have never seen the slightest tinge of blue in any living specimen.

***Vandellia crustacea**, *Benth.*,

has the calyx (I write this with the living plant under my eyes) quite as much folded and angular as in any genuine *Torenia*. Either it and *V. oblonga*, Benth., must therefore be transferred to *Torenia*, or the two genera, as suggested by me five years ago (Ann. Sc. Nat. Par. ser. 5, v. 232), must be combined. As *T. parviflora*, Ham., and others are in habit and size of flowers quite like *Vandelliæ*, and there is no character at all but the plication and generally rather more distinct obliquity of the calyx in the former to distinguish the two, I do not think they can be kept separate, not being, in fact, natural genera.

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† "Ut Medorum et Persarum, ita Botanicorum leges stabiles firmæque servandæ; hoc tantum modo inextricabilis fugienda confusio."—P. B. WEBB, *Spicil. Gorgon.* 153.

***Centranthera hispida**, *R. Br.*

In every fresh specimen I have examined from Hongkong, the neighbourhood of Canton, or Amoy, in all which localities I have myself gathered it, I have found the corolla of a dull ochreous yellow with reddish-brown blotches inside.

27. **Siphonostegia chinensis**, *Benth. in DC. Prod.* x. 538; *Hook. and Arn. Bot. Beech.* t. 44.

Found by the late Dr. Harland and myself in July 1856, growing abundantly on moist grassy slopes by the sea near West Point; but I am not aware that it has been collected by others, and I have not myself met with it since in the island. Extends into Northern China, the Amur territory, and Japan.

***Utricularia exoleta**, *R. Br.*; *Benth. Fl. Austr.* iv. 526. (= U. diantha, *Roem. and Schult.*; *Benth. Fl. Hongk.* 256.)

28. **Calosanthes indica**, *Blume*; *DC. Prod.* ix. 177.

In ravines on the northern side of the island, above Head-Quarter House. Occurs in India, chiefly near the coast, the Malayan islands, and Cochinchina. I have no specimens of this in my herbarium; but have seen fresh flowering ones and copious fruits gathered by Captain Maclean, formerly Military Secretary in Hongkong.

***Barleria cristata**, *Linn.*

The late Dr. Thomas Anderson, in his "Enumeration of Indian Acanthaceæ" (Journ. Linn. Soc. ix. 491), gives Hongkong and Canton as localities, with the remark "certissime ex hortis!" There is no reason offered for this very decided opinion; and the plant is not by any means common in Hongkong, occurring, for the most part, on the south side of the island: but I see no ground for doubting its being a genuine native. As to Whampoa and Canton, I can speak with greater confidence. It there occurs, in Danes' Island and in the low undulating hills to the north of the city, mingled with *Symplocos sinica*, Ait., *Bambusa flexuosa*, Munro, *Scolopia chinensis*, Clos, *Sageretia theezans*, Brongn., *Rosa Brunonis*, Lindl., *Berchemia lineata*, DC., and other ordinary plants, and has indubitably an equally good claim to be regarded as indigenous. I may add that I have never, during my long residence in China, seen the plant cultivated in a Chinese garden.

***Strobilanthes flaccidifolius,** *Nees in DC. Prod.* xi. 194; *T. Anders. in Journ. Linn. Soc.* ix. 481. (=S. Championi, *T. Anders. in Benth. Fl. Hongk.* 261.)

Dr. Anderson has shown that this plant, which, according to Fortune, is largely cultivated for tinctorial purposes in the province of Chekiang, is the source of the celebrated blue dye called "Room †", extracted by the Assamese and Burmese, and by the Mishmi hillmen.

***Justicia procumbens,** *Linn.*; *T. Anders. in Journ. Linn. Soc.* ix. 511. (=Rostellaria procumbens, *Nees*; *Benth. Fl. Hongk.* 265.)

***Dicliptera chinensis,** *Nees.*

Dr. Anderson has now ascertained (Journ. Linn. Soc. ix. 520) that *D. Burmanni*, Nees, and *D. Roxburghii*, Nees, which he had been disposed, with Mr. Bentham, to regard as identical with this, are quite distinct species.

***Caryopteris Mastacanthus,** *Schauer.*

This plant has a strong scent, exactly like that of the wood employed for sheathing lead pencils (*Juniperus virginiana*, Linn.?).

***Premna integrifolia,** *Linn.*; *Miq. Fl. Ind. Bat.* ii. 894. (=P. serratifolia, *Linn.*? *Benth. Fl. Hongk.* 269.)

Miquel doubts the identity of Linnæus's *P. serratifolia*; but, independently of this, the other name is much the more applicable—as the leaves are usually quite entire, or have at most a few blunt teeth, but are never serrate.

***Callicarpa breviceps,** *Hance in Ann. Sc. Nat. Par.* ser. 5, v. 233. (= C. longifolia, var. brevipes, *Benth. Fl. Hongk.* 270.)

I cannot regard this as a form of *C. longifolia*, Lam., which has longer and entire or minutely serrulate leaves, extremely viscid when fresh—glabrous branches—the blossoms scarcely one third the size, disposed in lax, many-flowered, longish-stalked cymes—the roundish-oval anthers eight or ten times as small, borne on long capillary exserted filaments, and the fruit only about $\frac{3}{4}$ of a line in diameter and flat at the top. In *C. brevipes*, on the other hand, the branches are clothed with a yellowish furfuraceous pubescence; the leaves, which are without any trace of viscidity, have distant shallow serratures; the cymes are almost sessile; the flowers fewer, larger; the large anthers only partially project beyond the corolla; and the fruit is spherical, and about as large as a pepper-corn. Mr. Sampson, as well as myself, has noticed the two for several years; and we both think it impossible they can be conspecific. *C. longifolia*, Lam., has not hitherto been found in Hongkong. See my remarks on these and allied species in the above-quoted periodical.

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† *Cfr.* Rondot, Le Vert de Chine, 34.

***Clerodendron fortunatum,** *Linn.*; *Schauer in DC. Prod.* xi. 673. (= C. castaneifolium, *Hook. and Arn. Bot. Beech.* 205.—C. lividum, *Lindl. Benth. Fl. Hongk.* 272.)

Dr. Seemann has ascertained, from examination of the Linnæan herbarium, that this is the true *C. fortunatum*. Osbeck's figure (Reise nach Ostindien, t. 11) is a very poor one.

***Vitex Loureiri,** *Hook. and Arn.*

This is not accurately described in the 'Flora Hongkongensis.' The leaves are not pubescent beneath, but more or less conspicuously studded with brown glands, and otherwise quite smooth; above they are quite scabrous to the touch, from being covered with small whitish points perforated in the centre. The corolla, quite smooth internally, has the lower half of the tube glabrous; but the upper portion and the limb are densely covered outside with very small peltate yellow glands, which are not shown in Hooker and Arnott's plate (Bot. Beech. t. 48). It is no doubt this peculiarity which led Loureiro to describe the flower as "luteo-viridis." It forms an erect tree, about 20 feet high, with a single stout stem, and is very distinct from *V. Negundo*, Linn., by its habit, its rigid, rough, pergameneous, densely reticulate leaves, abbreviated panicles, larger flowers, longer corolla-tube, and globular tomentose opaque drupe as large as a pea. The inaccuracy of the description led me, when I first found the plant, to refer it to *V. heterophylla*, Roxb., with Schauer's character of which it agrees in every respect, so that I still doubt if it is really distinct. I know of but one locality for it in Hongkong; and that is the shady wood fringing and overhanging the stream at Heongkong. It flowers and fruits in July and August.

***Salvia Fortunei,** *Benth.*

Extends up the Chinese coast at least as far north as Shanghae, whence I have a specimen gathered by the late Dr. Harland.

29. **Rumex chinensis,** *Campd.*; *Meissn. in DC. Prod.* xiv. 60.

In waste places, and by roadsides near the sea, not uncommon. Occurs on the adjacent mainland, in Cochinchina, throughout

India, in the Malay archipelago, in Formosa, and perhaps in Japan. This differs in nothing from the common European *R. maritimus*, Linn., save that the inner perigone-segments are half as large again, and have only one instead of two long setaceous teeth on each side below the middle.

30. **Polygonum interruptum,** *Bunge*; *Meissn. in DC. Prod.* xiv. 111.
In ditches and wet places. Extends to the north of China, but is not recorded from elsewhere. Possibly, as suggested by Prof. Meissner, a depauperated form of *P. minus*, Huds.

***Polygonum perfoliatum,** *Linn.*
The achenium of this plant is completely enclosed in, and adheres at its base to, the very fleshy accrescent perigone, which has become of a deep indigo-blue colour. On account of this character, and also because the radicle is much longer than in any other known species, this has been raised to generic rank under the name of *Chylocalyx* by Hasskarl, whose view is adopted by F. Schmidt (in Maxim. Prim. Fl. Amur. 236), Miquel (Fl. Ind. Bat. i. 1012), and latterly by Meissner (in Miq. Ann. Mus. Bot. Lugd.-Bat. ii. 65). But the latter character can scarcely be considered of sufficient importance to found a genus on, and the extent to which the perigone becomes changed in fruit varies a good deal in different *Polygona*. In *P. chinense*, Linn., for instance, when growing in good soil, it not only becomes quite baccate, but acquires a blue colour also. Instead of creating this into a new genus, I believe it would be better, as suggested by Ferd. v. Mueller (Fragm. Phytogr. Austr. iv. 131; Veget. of Chath. Isl. 50), to reunite *Muehlenbeckia* with *Polggonum*, from which there are no characters to distinguish it but the fleshy fruiting perigone, the fringed or papillose stigmas, and the unisexual flowers. So far as regards the latter distinction, no great stress can well be laid on it, unless we are prepared in the allied genus *Rumex* to separate the Docks from the Sorrels, which groups, indeed, seem to me both in sensible properties and character more distict, *inter se*, than *Polygonum* and *Muehlenbeckia*. With respect to the succulent perigone, this is absent in *M. polybotrya*, Meissn., *M. Cunninghamii*, F. v. Muell., and *M. polygonoides*, F. v. Muell.; whilst the degree of fimbriation of the stigmas is very variable, scarcely observable in some of the South-American species, and absent in *M. Cunninghamii*, which is intermediate between the two genera.

P. flaccidum, Roxb., *P. Donii*, Meissn., *P. serrulatum*, Lag., *P. jucundum*, Meissn., all found on the adjacent mainland, in ditches and pools, will most likely prove to be natives of Hongkong.

***Suæda australis,** *Moquin.*

Mr. Bentham now (Fl. Austr. v. 206) concurs with J.D. Hooker in regarding this as not specifically distinguishable from *S. maritima*, Dumort., a plant widely spread over the sea-shores of Europe and America.

***Cinnamomum Burmanni,** *Blume; teste Meissn. in DC. Prod.* xv. 16. (=C. dulce, *Nees; Benth. Fl. Hongk.* 290.)

I adopt Blume's name, as the oldest, because Meissner identified with his plant specimens named *C. dulce* in Nees von Esenbeck's own handwriting. Miquel, however (Ann. Mus. Bot. Lugd.-Bat. ii. 195), considers Nees's *C. dulce* the same as Meissner's *C. Sieboldi.* It is probable that the species have been unjustifiably multiplied. I do not think this tree, which supplies, unless I err, in part, at least, the Cassia-bark of the Canton market, is indigenous to Hongkong.

***Cinnamomum Neesianum, β. petiolare,** *Meissn. in DC. Prod.* xv. 26. (=Camphora Parthenoxylon, *Benth. Fl. Hongk.* 290.)

Meissner denies that this is identical with Nees's *Camphora Parthenoxylon.*

***Tetranthera laurifolia,** *Jacq.; Meissn. in DC. Prod.* xv. 178. (=T. citrifolia, *Benth. Fl. Hongk.* 293.)

Bentham gives Jussieu as the authority for the name adopted by him, but without any specific reference: it is very inappropriate, and has been abandoned by myself in the 'Flora Australiensis' for the present one.

***Litsæa pulchella,** *Meissn. in DC. Prod.* xv. 224. (=Litsæa ceylanica, *Benth. Fl. Hongk.* 294, but not of *Nees.*)

Not known out of the island. Meissner considers this more nearly allied to *L. aciculata*, Blume, and *L. glauca*, Siebold, than to *L. ceylanica*, Nees.

The natural order Euphorbiaceæ has been thoroughly revised, in the fifteenth volume of DeCandolle's 'Prodromus,' by Herr Johann Müller, of Aargau, who, discarding the old arrangement, divides the family into ten tribes and a very great number of subtribes, and has made most extensive changes in the circumscription of the genera, differing widely from M. Baillon in his views as to their position and limits. I do not presume to offer any opinion on the merits of this arrangement; but the extent of the changes effected is in itself a sufficient proof of the great care with which the recension has been conducted. It is a matter of regret that the ordinary rules for indicating the authorities for generic and specific names have been so extensively departed from as to have called forth reasonable protests from many botanists. I subjoin the nomenclature adopted by Herr Müller for the Hongkong plants, when it differs from that of Mr. Bentham.

*__Daphniphyllum glaucescens,__ *Blume*; *J. Müll. in DC. Prod.* xvi. 3. (=D. Roxburghii, *Baill.*; *Benth. Fl. Hongk.* 316.)

This genus is regarded by J. Müller as the type of a distinct order.

*__Agyneia bacciformis,__ *A. Juss.*; *J. Müll. in DC. Prod.* xv. 238. (=Phyllanthus bacciformis, *Linn.*; *Benth. Fl. Hongk.* 310.)

*__Antidesma Ghæsembilla,__ *Gaertn.*; *J. Müll. in DC. Prod.* xv. 251. (=A. paniculatum, *Roxb.*; *Benth. Fl. Hongk.* 318.)

*__Phyllanthus__ † (**Euglochidion**) **Arnottianus,** *J. Müll. in DC. Prod.* xv. 279. (=Glochidion molle, *Hook. and Arn.*; *Benth. Fl. Hongk.* 314.)

*__Phyllanthus__ (**Euglochidion**) **hongkongensis,** *J. Müll. in DC. Prod.* xv. 282. (=Glochidion litorale, *Benth. Fl. Hongk.* 314, but not of *Blume*, according to J. Müller.)

*__Phyllanthus__ (**Euglochidion**) **Benthamianus,** *J. Müll. in DC. Prodr.* xv. 282. (=Glochidion macrophyllum, *Benth. Fl. Hongk.* 315.)

*__Phyllanthus__ (**Hemiglochidion**) **philippinensis,** *J. Müll. in DC. Prod.* xv. 295. (=Glochidion philippinensis, *Benth. Fl. Hongk.* 314.)

*__Phyllanthus__ (**Hemiglochidion**) **Wrightii,** *J. Müll. in DC. Prod.* xv. 298. (=Glochidion Wrightii, *Benth. Fl. Hongk.* 213.)

*__Phyllanthus__ (**Hemiglochidion**) **eriocarpus,** *J. Müll. in DC. Prod.* xv. 306. (=Glochidion eriocarpum, *Champ.*; *Benth. Fl. Hongk.* 314.)

*__Phyllanthus__ (**Hemiglochidion**) **puberus,** δ. **sinicus,** *J. Müll. in DC. Prod.* xv. 307. (=Glochidion sinicum, *Hook. and Arn.*; *Benth. Fl Hongk.* 314.)

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† I have enumerated all the Hongkong species of this large genus, as limited by J. Müller, even where there is no change of name, for the purpose of showing the section in which he places each.

***Phyllanthus** (**Kirganelia**) **microcarpus**, *J. Müll. in DC. Prod.* xv. 343. (=Cicca microcarpa, *Benth. Fl. Hongk.* 312.)

***Phyllanthus** (**Cathetus**) **fasciculatus**, *J. Müll. in DC. Prod.* xv. 350. (=Phyllanthus cinerascens, *Hook. and Arn.*; *Benth. Fl. Hongk.* 311.)

J. Müller, acting on the objectionable Rule 57 of the Paris Congrès International, has rebaptized this, because it is Loureiro's *Cathetus fasciculata* †. According to my ideas of precedence in nomenclature, it should have retained Sprengel's name of *Phyllanthus cochinchinensis*, which is its oldest specific one in the genus; but, as Müller describes Loureiro's *Tricaryum cochinchinense* as *P. cochinchinensis*, to insist on this would involve the creation of another new name, which is a greater evil than the acquiescence in a false canon of nomenclature.

***Phyllanthus** (**Emblica**) **Emblica**, *Linn.*; *Benth. Fl. Hongk.* 312; *J. Müll. in DC. Prod.* xv. 352.

***Phyllanthus** (**Paraphyllanthus**) **maderaspatensis**, *Linn.*; *Benth. Fl. Hongk.* 311; *J. Müll. in DC. Prod.* xv. 362.

***Phyllanthus** (**Paraphyllanthus**) **urinaria**, *Linn.*; *Benth. Fl. Hongk.* 310; *J. Müll. in DC. Prod.* xv. 364.

***Phyllanthus** (**Euphyllanthus**) **simplex**, *Retz.*; *J. Müll. in DC. Prod.* xv. 391. (=P. anceps, *Vahl*; *Benth. Fl. Hongk.* 311.)

***Phyllanthus** (**Euphyllanthus**) **Niruri**, *Linn.*; *Benth. Fl. Hongk.* 311; *J. Müll. in DC. Prod.* xv. 406.

***Phyllanthus** (**Eriococcus**) **leptoclados**, *Benth.*; *J. Müll. in DC. Prod.* xv. 422.

***Melanthesopsis fruticosa.** *J. Müll. in DC. Prod.* xv. 437. (=Melanthesa chinensis, *Blume*; *Benth. Fl. Hongk.* 313.)

***Aporosa microcalyx**, *Hassk.*; *J. Müll. in DC. Prod.* xv. 471. (=A. fruticosa, *Benth. Fl. Hongk.* 117.)

A. leptostachia, Benth., Möller regards as a mere form of this; but Blume's *A. fruticosa*, of which he had examined authentic specimens, is, he states, a quite distinct species.

***Croton crassifolius**, *Geisel. Monogr. Croton.* 19, *fide J. Müll. in DC. Prod.* xv. 588. (=C. chinense, *Benth. Fl. Hongk.* 309.—C. tomentosus, *J. Müll. l. c.*)

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† "Priora resuscitare præcipue ineptum est, si primus obsoleti nominis venditor sub alieno et sæpe falso nomine generico proposuerit; qui sub novo generico nomine extinctum illud, sigla sua modo adponendi gratia, restituunt, tempori male patrissant."—Fries, Præf. in Mantiss. Nov. Fl. Suec.

I have retained the oldest specific name, not recognizing the right of a botanist to give a new one because some prior author had used it when describing the plant under another genus †.

***Claoxylon indicum**, *Hassk.*; *J. Müll. in DC. Prod.* xv. 782. (=C. parviflorum, *Benth. Fl. Hongk.* 305.)

J. Müller states that Adrien de Jussieu's *C. parviflorum* is a perfectly distinct species.

***Alchornea trewioides**, *J. Müll. in DC. Prod.* xv. 901. (=Stipellaria trewioides, *Benth. Fl. Hongk.* 305.)

***Mallotus Apelta**, *J. Müll. in DC. Prod.* xv. 963. (=Rottlera chinensis, *A. Juss.*; *Benth. Fl. Hongk.* 306.)

***Mallotus paniculatus**, *J. Müll. in DC. Prod.* xv. 965. (=Rottlera paniculata, *A. Juss.*; *Benth. Fl. Hongk.* 307.)

***Mallotus Furetianus**, *J. Müll. in DC. Prod.* xv. 968. (=Hancea muricata, *Benth. Fl. Hongk.* 306.)

Wight's *Claoxylon muricatum* is, according to J. Müller, a distinct species. This plant exhales, while alive, a most powerful odour of liquorice—so strong, that I have been often guided to it by that alone—and retains it also for years in the herbarium.

***Mallotus Hookerianus**, *J. Müll. in DC. Prod.* xv. 975. (=Hancea Hookeriana, *Benth. Fl. Hongk.* 306.)

The primary veins of the leaves are stouter and more numerous in this than in the last.

***Mallotus philippinensis**, *J. Müll. in DC. Prod.* xv. 980. (=Rottlera tinctoria, *Roxb.*; *Benth. Fl. Hongk.* 307.)

***Mallotus repandus**, *J. Müll. in DC. Prod.* xv. 981. (=Rottlera ? cordifolia, *Benth. Fl. Hongk.* 307.)

***Macaranga Tanarius**, *J. Müll. in DC. Prod.* xv. 997. (=Mappa Tanaria, *Spr.*; *Benth. Fl. Hongk.* 304.)

***Excæcaria** (**Triadica**) **sebifera**, *J. Müll. in DC. Prod.* xv. 1210. (=Stillingia sebifera, *Michx.*; *Benth. Fl. Hongk.* 302.)

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† I have read with the greatest satisfaction the following judicious remarks on this subject—which exactly represent my own opinions—by Dr. R. H. C. C. Scheffer, at present in charge of the splendid Botanic Garden at Buitenzorg, in Java. "Haud necesse videtur speciei a duobus auctoribus sub generibus et nominibus specificis diversis editæ, ubique nomen specificum antiquius sub genere haud servato datum restituere in locum ejus quod sub genere genuino datum fuit. Cur v. c. *Baliospermum axillare*, Bl., a Willdenow antea sub *Jatrophæ montanæ* nomine editum, nunc *B. montanum* vocaremus? Ita etiam absque necessitate synonymorum numerus augetur."—*Observ. de Euphorb. Archip. Ind., in Miq. Ann. Mus. Bot. Lugd.-.Bat* iv. 119.

***Excæcaria (Triadica) discolor**, *J. Müll. in DC. Prod.* xv. 1210. (=Stillingia discolor, *Champ.*; *Benth. Fl. Hongk.* 303.)

***Excæcaria (Sclerocroton, Parasapium) japonica**, *J. Müll. in DC. Prod.* xv. 1217. (=Stillingia japonica, *Sieb. and Zucc.*; *Benth. Fl. Hongk.* 303.)

***Excæcaria (Euexcæcaria, Commia) Agallocha**, *Linn.*; *J. Müll. in DC. Prod.* xv. 1220.

A much-branched shrub, 8 to 10 feet high, growing plentifully by the side of the path in a salt or brackish marshy spot near Tai tum tuk, *T. Sampson*, May 19, 1870. Widely spread throughout Southern Asia, Ceylon, the Malayan and Philippine Islands, and Eastern Tropical Australia. There is a single sheet only of this in Mr. Sampson's herbarium, with flowers of both sexes and ripe fruit, but merely half a dozen leaves, the plant being hysteranthous.

1. **Buxus Harlandi**, sp. nov.: Ramulis pubescentibus, foliis subsessilibus anguste obovatis apice emarginatis 10–15 lin. longis supra venis tenuissimis creberrimis ramosis elevatis notatis, floribus utriusque sexus sessilibus, filamentis capillaribus calyce triplo longioribus, antheris duplo longioribus quam latis, ovarii rudimento calycis laciniis obtusis paululum breviore longitrorsum sulcato claviformi nempe apice in discum magnum capitatum rugulosum conspicue 4-lobum dilatato, stylis ovario paulo longioribus crassis apice valde dilatatis bilobis recurvulis medio sulcatis, capsula læviuscula opaca 3½ lin. longa cornibus ea quadruplo brevioribus apice recurvis. (=B. sempervirens, *Benth. Fl. Hongk.* 315, but not of *Linnæus.*)

In the very rocky bed of the stream above the bridge at Tai tam tuk, first discovered by the late Dr. Harland and myself, flowering in June, fruiting in October, 1858. Not certainly known to occur out of the island (Exsicc. n. 322). By the great development of the ovary-rudiment, this is far more nearly allied to *B. japonica*, J. Müll., than to *B. sempervirens*, Linn.; but it differs by its much longer and narrower leaves, longer less stout filaments, shorter anthers, and long styles. The horns of the capsule are more slender and recurved than in *B. sempervirens*; and the very delicate closely placed branching veins with which the upper surface of the leaves is marked are not found in either. *Buxus chinensis*, Link, cited as a synonym by Mr. Bentham, is *Simmondsia californica*, Nutt., placed near *Buxus* by J. Müller, but located in Garryaceæ by Le Maout and Decaisne ('Traité Gén. de Bot. 255), and doubtfully by Nuttall. Both Baillon and Mueller, following Plée, regard *Buxus* as the type of a distinct natural order †.

***Engelhardtia chrysolepis**, *Hance in Ann. Sc. Nat. Par.* ser. 4, xv. 227. (=E. Wallichiana, *Lindl.*, β. chrysolepis, *Cas. DC. in DC. Prod.* xvi. ii. 142.—Engelhardtiæ sp., *Benth. Fl. Hongk.* 318.)

In the Happy-Valley woods, but not common. Not known out of the island. The number of stigmas and the golden scales of the fruit and inner perigone seem to indicate this as distinct from the Singapore *E. Wallichiana*, Lindl.

***Myrica Nagi**, *Thunb.*; *Cas. DC. in DC. Prod.* xvi. 2. 151. (=M. rubra, *Sieb. and Zucc.*; *Benth. Fl. Hongk.* 322.)

32. **Quercus Irwinii**, *Hance in Ann. Sc. Nat. Par.* ser. 4, xviii. 229; *A. DC. Prod.* xvi. ii. 84.

In the Happy-Valley woods, very rare. Not known out of the island. Found by the Rev. J. J. Irwin, D.D., and myself, in fruit, in November 1862.

***Quercus Hancei**, *Benth.*; *Hance in Ann. Sc. Nat. Par.* ser. 4, xviii. 230; *A. DC. Prod.* xvi. 2. 96.

Cup corky, hemispherical, about 2 lines long, silky inside, and with greyish scale-like pubescence outside, with concentric rings repand and shortly toothed at the edge, so that at first sight they look like distinct scales. Nut much exserted, ovoid, 7 lines long, pale brown, with a protuberant umbo. Leaves not reticulate when fresh, but only after drying.

***Castanopsis concinna**, *A. DC. in DC. Prod.* xvi. 2. 110. (=Castanea concinna, *Champ.*; *Benth. Fl. Hongk.* 319.)

In an important memoir by Prof. Œrsted, of Copenhagen, 'Aperçu sur la classification des Chênes,' published in 1869 as an accompaniment to a posthumous work of Prof. Liebmann's, illustrated with fine plates, on tropical American oaks, he divides Cupuliferæ into two suborders, Quercinæ and Castaninæ, placing in the first, distinguished by having pendulous male amenta and the stigmas occupying the whole inner face of the style, the genera *Fagus*, *Quercus*, and *Cyclobalanopsis*—in the second, to which he attributes erect male amenta, and styles stigmatic only at the apex, *Castanea*, *Castanopsis*, *Pasania*, and *Cyclobalanus*, the limits of these genera being somewhat modified from the sections of former writers, on which they are partly founded. I had myself suggested the combination of both *Castanea* and *Castanopsis* with *Quercus* (Journ. Linn. Soc. x. 201), there not seeming to be any greater diversity of types within the genus, as thus limited, than in *Ficus*, which most botanists concur in preserving intact; but M. Œrsted has undoubtedly shown cause for a respectful consideration of his views.

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† I avail myself of this opportunity to note the structure of the ♂ flowers (I have seen no ♀ ones) of my *B. stenophylla*, which J. Müller says I have not distinguished by specific characters; this is owing to my not having known where to look for these, until the appearance of his excellent review of the genus:—Filamentis calyce dimidio v. vix duplo longioribus complanatis, ovarii rudimento calycis segmentis obtusis paulo breviore complanato apice parum dilatato subbilobo.

M. Casimir de Candolle, who has revised the Piperaceæ for the Prodromus, has reduced nearly all Miquel's genera to *Piper*, and mentions the following species, all belonging to his section *Eupiper*, as occurring in Hongkong. I cannot certainly identify them with those described by Mr. Bentham, except the last; and he appears to record the second and third, which are differently named in the 'Flora Hongkongensis,' only on Dr. Seemann's authority in the 'Botany of the Herald.'

Piper hongkongensis, *Cas. DC. in DC. Prod.* xvi. 1. 347.
Piper Betle, *Linn.*; *Cas. DC. in DC. Prod.* xvi. 1. 359.
Piper arcuatum, *Blume*; *Cas. DC. in DC. Prod*, xvi. 1. 360.
Piper sinense, *Cas. DC. in DC. Prod.* xvi. 1. 361. (=Chavica sinensis, *Champ.*; *Benth. Fl. Hongk.* 335.)

***Pinus sinensis,** *Lamb.*

Prof. Parlatore, in his recension of the Pinaceæ for De Candolle's Prodromus (xvi. 2. 389), states that the North Chinese and Japanese tree usually considered to be *Pinus Massoniana*, Lamb., is a distinct species, for which he proposes the name of *P. Thunbergii*; and that Lambert's true species is identical with his *P. sinensis*, to which he therefore restores the other name. But, supposing him to be correct in this decision, the suggested change is surely not only unnecessary, but objectionable—because, as there is no doubt that the tree so universal in Southern China is Lambert's *P. sinensis*, to substitute for this name another which, whether rightly or wrongly, has invariably been attributed to a different species, can only be productive of ambiguity and confusion, and has no argument whatever to recommend it.

33. **Nechamandra Roxburghi,** *Planch. in Ann. Sc. Nat. Par.* ser. 3, xi. 78; *Miq. Fl. Ind. Bat.* iii. 235.

In rice-fields and pools, flowering in July and August, but not common. Found also in the Indian peninsula, in Bengal, as far north as Assam, and in the Malay archipelago.

34. **Alpinia stachyodes**, sp. nov.: foliis longe vaginantibus sessilibus lanceolatis coriaceis 8–15 poll. longis 1½ poll. latis præter marginem dense et breviter ciliatum apicemque in acumen lineare tomentosum pollicare productum glaberrimis, ligula scariosa vaginas valide nervosas marginante tomentella apice breviter producto rotundato bifido dense ciliato, spica terminali erecta densa cylindracea 3½ poll. longa basi bractea involucrali scariosa lineari ei circiter æquilonga fulta, floribus plerumque ternis circ. ¾ poll. longis sessilibus singulo fasciculo bractea late ovata scariosa exteriore atque duabus tribusve interioribus persistentibus cum rachi breviter sericeo-tomentosis stipato, perigonio exteriore tomentoso tubuloso apice trilobo lobis ovatis acutis dimidium tubum superantibus, perigonii interioris tubo tenui tomentello lobis oblongis cucullatis dense tomentosis tertio paulo longiore et latiore, labello crispulo deltoideo sæpe bifido basi processibus 2 filiformibus lineam longis aucto, stamine labellum paulo superante, ovario dense hirsuto, stylo apice sensim dilatato paulo ultra antheram 1½-linealem immarginatam producto, stigmate cupulato piloso, glandulis epigynis parvis oblongis apice rotundatis integris, fructu pisi majoris mole globoso tomentoso pallide flavidulo inflato ecostato pericarpio crustaceo tenui fragili bracteis persistentibus fulto atque perigonio exteriore longo tubuloso rigido marcido coronato, seminibus 5–6 mucoso-arillatis saturate cinereis plano-convexis plus minus angulatis rugulosis basi umbilico brunneo excavato conspicuo notatis ab ipso vertice secus faciem profunde sulcatis. (*Exsicc.* n. 1231.)

This interesting plant, gathered by me (I believe, in the Happy-Valley woods) in June 1857, is represented in my herbarium by two flowering and one fruiting specimens, unfortunately the upper portion of the stems only and without rhizome. There is, however, I think, no doubt that it is an entirely new species, most closely allied to, though differing in many points from, *Alpinia spicata*, Roxb. (Fl. Ind. i. 70; Horaninow, Prod. Monog. Scitam. 34). The large, broadly ovate, scarious bracts give the spike a peculiar comose appearance. It has not to my knowledge been found elsewhere, nor been gathered in the island by any other collector. The seeds taste very pleasantly, like cardamoms, but with a flavour suggesting the addition of lemon-peel, and would certainly be worth cultivating for medicinal purposes. As, indeed, it is quite possible that they are collected for this purpose, though the plant differs from any of those described by Loureiro, or mentioned in Mr. Hanbury's valuable paper on Cardamoms, I have purposely given a very full diagnosis.

***Microstylis congesta,** *Rchb. fil. in Walp. Ann. Bot. Syst.* vi. 206. (= Dienia congesta, *Lindl.*; *Benth. Fl. Hongk.* 352.) "Huc revocandæ sunt omnes *Dieniæ*, Lindl., ob solum directionis columnæ, characterem haud sufficientem, olim separatæ. Quam bene congruunt hæc genera ex eo patebit, quod ill. Lindley exacte eandem plantam *Microstylidem monophyllam* et sub *Microstylide* et sub *Dienia* (*D. Gmelini*) descripsit."—*Rchb. fil. l. c.*

35. **Thelasis? pygmæa,** *Lindl. in Journ. Linn. Soc.* iii. 63. (= Euproboscis pygmæa, *Griff.*; *Wight, Ic.* t. 1732.)

Three or four specimens only, gathered by me at Aberdeen in August 1857, but found by no one since, and only known besides from Malabar, the Khasia mountains, and Nipal. Prof. Lindley did not feel sure whether this was referable either to the Indian species or to the Philippine *T. triptera*, Rchb. fil. But in one specimen I find a fruit or two already split along the sutures; and there is no trace of wings to the ovary, as described by Prof. H. G. Reichenbach (Walp. Ann. Bot. Syst. vi. 923) in *T. triptera.*

36. **Sarcanthus teretifolius,** *Lindl. Gen. et Sp. Orch.* 234.

On rocks below Victoria Peak; gathered by me in October 1853. Not found by any other collector, and not known out of Southern China. This is undoubtedly Lindley's plant, readily known by the long blunt helmet-shaped spur of its lip, with the apex produced into a sharp fleshy process, and by its thickly bearded column. But I strongly suspect it is also the one taken by Lindley (*Luisia* in Fol. Orchid. p. 1) for *Luisia teres,* Blume—Colonel Champion having found his specimen, which was flowerless, in apparently the same locality. Different as the two are in floral structure, sterile specimens are very much alike indeed. Of *Luisia teres* I have seen no Chinese example; but I possess a Japanese one from M. Maximowicz labelled as from mossy rocks on dry mountains around Nagasaki, where it is very rare. Thunberg's plate of this (Icon. Pl. Jap. dec. i. t. 7), which Blume (Mus. Bot. Lugd.-Bat. i. 64) styles "mediocris," is really valueless, as it shows no flower at all.

37. **Appendicula.**

I have two species of this genus from Hongkong. One, gathered by Mr. J. C. Bowring in March 1859, and given me by him as Colonel Champion's plant described as *A. bifaria* by Dr. Lindley, has no aerial roots, subcoriaceo-membranaceous leaves about 1 inch long and 3½ lines broad and only slightly retuse at the apex, and a very thin and short, lateral, not terminal, few-flowered raceme, with erect bracts. The flowers have all fallen. The other, which I found straggling over rocks in the Wongneichung valley in August 1861, has copious aerial roots, very rigid coriaceous leaves more than 2 inches long, about 8 lines broad, and conspicuously emarginate, and a lateral raceme about 5 inches in length; flowers small, white, with a conspicuous obtuse spur, and reflexed bracts. Whether this latter be one of Blume's species, I have no means of ascertaining.

38. **Zeuxine tripleura,** *Lindl. in Journ. Linn. Soc.* i. 186. (=Tripleura pallida, *Lindl. Gen. et Sp. Orch.* 452.)

Near the swamp at the head of the Happy-Valley waterfall; discovered by Mr. Sampson in October 1868. Occurs also in Silhet and Sikkim. I believe I found a specimen of this plant (afterwards burnt at the destruction of the Canton factories) many years ago, by the road-side towards Pok fu lum, growing on inundated gravel; and if so, it exhales a powerful fragrance of cloves. Mr. Sampson is not clear on this point. About 10 inches high. Leaves four, membranaceous, narrowly lanceolate, acuminate, 2 inches in length, of a pale reddish tint. Upper portion of stem clothed with distinct sheaths, contrary to Lindley's statement. Raceme dense, about 1½ in. long. Flowers yellowish white, subtended by extremely thin, white, 3-nerved, lanceolate, setaceo-acuminate bracts, ciliate, with articulate hairs about as long as the flowers. Labellum thickened at the base, with erect, undulate margins, narrowed in the middle, and then widening to the point, which is emarginate. Ovary clothed with crisp, articulate, dirty white, glandular hairs. My solitary specimen from Mr. Sampson agrees well with two others in my possession gathered in Silhet by Dr. Wallich.

39. **Tropidia grandis,** sp. nov.: glaberrima; foliis elliptico-lanceolatis acutis 7-nerviis 8–10 poll. longis medio 2½ poll. latis, pedunculo robusto 10-pollicari vaginis 3 aphyllis scariosis lanceolato-linearibus instructo, spica corymbosa, floribus pollicaribus, bracteis lato-linearibus scariosis ovarium subæquantibus.

In the Happy-Valley woods, July 1866 (Exsicc. n. 13343). Not known from elsewhere. Differs much in habit and aspect from *T. curculigoides*, Lindl., by its long vaginate peduncle, large flowers, and leaves like those of a *Phaius*. Schauer's plate of his

Ptychochilus septemnervis (Pl. Meyen. t. 12, B), which is a native of the Philippines, represents a distinct plant, and, though with wider leaves, doubtless much nearer the Ceylòn and Silhet species than the present.

40. **Halophila ovata,** *Gaud.*; *Miq. Fl. Ind. Bat.* iii. 230.

A sterile specimen of this obscure plant, gathered by the late Dr. Harland in Kau-lung Bay in 1856, is in my herbarium.

41. **Lemna minor,** *Linn.*; *Koch, Syn. Fl. Germ.* ed. 3, ii. 590; *A. Gray, Man. Bot. N. Un. St.* ed. 5, 479.

In pools everywhere. Found in stagnant water throughout the whole world, except in the very coldest regions.

***Pandanus odoratissimus,** *Linn. fil.*; *Kunth, Enum. Plant.* iii. 94. (= P. verus, *Rumph.*; *Kurz in Seem. Journ. Bot.* v. 125.)

Common along the sea-shore, and often used for making hedges. Distributed throughout all the coasts of India as far as Arabia, in Assam, the Archipelago, Southern China, Tropical Australia, and Polynesia. This is the species referred in the 'Botany of the Herald' to *P. fascicularis*, Lam., which Mr. Kurz says is a synonym, and not a distinct species, as described by Kunth.

***Pandani** sp.

Another Screw-pine occurs not uncommonly in ravines and shady woods. It is stemless and with long mottled leaves, which are brittle and readily crack across, not breaking in two, but leaving the part above the fracture to hang down in a flaccid manner. The fruit, which I have only seen on one occasion, when two were gathered by the late Dr. Harland, is ovoid, and the drupes (which, I think, are collected in phalanges) are crowned by two strongly curved spines coalescent at the base. I have no specimen of either foliage or fruit in my herbarium.

***Phœnix farinifera,** *Roxb. Fl. Ind.* iii. 785; *Kunth, Enum. Plant.* iii. 257; *Hance in Seem. Journ. Bot.* vii. 15. (=P. acaulis? *Benth. Fl. Hongk.* 340.)

If, as is most likely, this is identical with Loureiro's *P. pusilla*, that name, as the oldest, must be restored.

***Thysanotus chinensis,** *Benth.*; *Hance in Ann. Sc. Nat. Par.* ser. 5, v. 245.

On the grassy hill-slope above the village of Pok fu lum, by the path descending from the Gap. I have shown in the above place that the petals of this species have as long and conspicuous a fringe as in its Australian congeners.

***Smilax China**, *Linn.*; *Kunth, Enum. Plant.* v. 243. (=S. ferox, *Wall.*; *Benth. Fl. Hongk.* 370.)

There is, I believe, no doubt of Wallich's plant being identical with that of Linnæus, which supplies a part at least of the "China root" of commerce. It is gratifying to be able to quote, in support of this opinion, so high an authority as Mr. Daniel Hanbury, who has lately informed me that the examination of a great many specimens fully convinces him that it is well founded.

*** Commelyna.**

Mr. C. B. Clarke, in a valuable paper "On the Commelynaceæ of Bengal" (Journ. Linn. Soc. xi. 442), says that the seeds of *C. salicifolia*, Roxb., are smooth, those of *C. communis*, Linn., reticulate; both species have two of the cells 2-, the remaining one 1-seeded. He transfers *C. cæspitosa*, Roxb., as a synonym from the former to the latter species. In *C. benghalensis*, Linn., I find the seeds of a greyish-black colour, irregularly transversely rugose, oblong, rounded on the dorsal and flattened on the ventral face, and with the embryo not opposite, but lateral as regards the linear hilum, to which, indeed, one side of its plumular extremity is nearly contiguous.

***Pollia sorzogonensis**, *Endl.*

Mr. Clarke (*l. c.*) not only combines with this, under the name of *P. indica*, Thw., the Japanese *P. japonica*, Kth. (which I have also from Canton province), but also the Javan *P. thyrsiflora*, Endl., the inflorescence of which is very different. The leaves of the Hongkong plant are perfectly smooth, those of *P. japonica* extremely scabrous to the touch on both surfaces.

42. **Eriocaulon sexangulare**, *Linn.*; *Kunth, Enum. Plant.* iii. 551; *Kærn. Monogr. Eriocaul.* 53.

In sandy places by the sea, Kau-lung peninsula: discovered by Mr. Sampson in August 1864. On the continent of India, in Ceylon, the Philippines, Java, Japan, and Abyssinia. With 5-nerved leaves, broader and longer than in Drs. Hooker and Thomson's Malabar specimens. Körnicke records his variety *β, vulgaris* with 3-nerved leaves both from Japan and China (the latter specimens, I presume, gathered by Meyen or Philippi, and therefore from the south), also (in Miq. Ann. Mus. Bot. Lugd.-Bat. iii. 162) the present form from Japan.

43. **Cyperus castaneus**, *Willd.*; *Nees in Wight, Contrib.* 79; *Kunth, Enum. Plant.* ii. 21.

In dry, sandy and gravelly places. Found also in the Indian peninsula, Ceylon, and the Malay archipelago.

44. **Cyperus nigro-viridis,** *Thw. Enum. Pl. Zeyl.* 345.

Found in Hongkong by the late Dr. Harland, and on the adjacent continent by myself. A native also of the Indian peninsula and Ceylon.

***Cyperus pennatus,** *Lam.*,
is, according to Mr. Kurz (Journ. As. Soc. Beng. xxxix. 85), Heyne's *C. pallidus*; and if so, the name is very good. The plant taken for this by Esenbeck (Wight, Contrib. 79), according to a specimen from Dr. Thwaites (C. P. 3559), is quite different, and the name is not appropriate to it.

45. **Scirpus plantagineus,** *Rottb.* (=Eleocharis plantaginea, *R. Br.*; *Kunth, Enum. Plant.* ii. 153; *Steud. Syn. Pl. Cyp.* 82.)

In ditches on the racecourse, Happy Valley, plentiful; gathered by me in November 1862. Found in India, Ceylon, the Malayan islands, Madagascar, and Japan. I found this plant growing in sea-sand on the Island of Ku lung su, Amoy.

46. **Scirpus (Eleocharis) laxiflorus,** *Thw. Enum. Pl. Zeyl.* 435.

In the swamp in the Happy-Valley woods; gathered by Mr. Sampson in July 1866 and October 1868. Only known besides from Ceylon.

***Scirpus barbatus,** *Rottb.* (=Isolepis barbata, *R. Br.*; *Benth. Fl. Hongk.* 393.)

***Scirpus supinus,** *Linn.* (=Isolepis supina, *R. Br.*; *Benth. Fl. Hongk.* 394.)

Bentham and, following him, Thwaites retain *Isolepis* as a genus, whilst uniting *Eleocharis* with *Scirpus*; but, of the two, *Eleocharis* has unquestionably the higher claim to be kept separate, characters derived from the style being more constant and of greater value than the presence or absence of hypogynous setæ; and both Parlatore and Asa Gray admit it to generic rank while merging *Isolepis* in *Scirpus*. Grisebach, probably with more justice, reduces *Fimbristylis* even to *Scirpus*; for *F. capillaris*, A. Gray, has about equal claims to rank with *Isolepis*.

***Fimbristylis rigidula,** *Nees in Wight, Contrib.* 99; *Steud. Syn. Pl. Cyp.* 116. (=F.diphylla, *Vahl*, var.? leptophylla, *Benth.Fl. Hongk.* 392.)

Hongkong specimens, determined by Mr. Bentham himself, are certainly identical with Dr. Thwaites's C. P. 3232.

***Fimbristylis complanata**, *Link*.

The fibrous roots of this exhale, when fresh, an extremely powerful odour perceptible at a foot or two distance, like a mixture of resin, camphor, and pepper. This is not noticeable when they are dried; but they then possess a bitter subcamphoraceous taste, and might, I should think, be advantageously employed in medicine as a stomachic and stimulant tonic.

47. **Fimbristylis cylindrocarpa**, *Wall.*; *Kunth, Enum. Plant.* ii. 222; *Kurz in Journ. As. Soc. Beng.* xxxix. 85. (=F. Arnottii, *Thw. Enum. Pl. Zeyl.* 348.)

In wet spongy ground in the Happy Valley; first detected by me in August 1861. Also in various parts of continental India, Ceylon, Burma, and the Malayan isles. To this Mr. Kurz refers, besides, *F. schœnoides β. monostachya*, Nees, and *F. abjiciens*, Steud.

48. **Fimbristylis insignis**, *Thw. Enum. Pl. Zeyl.* 349.

On hill-sides near Pok fu lum; also near Canton. Occurs in Ceylon, and also in Khasia; for the plant from thence distributed by Drs. Hooker and Thomson under the ticket "*Trichelostylis* n. 20" is evidently the same.

***Fimbristylis monostachya**, *Thw. Enum. Pl. Zeyl.* 434. (=Abildgaardia monostachya, *Vahl*; *Benth. Fl. Hongk.* 389.)

***Fimbristylis Eragrostis**, *mihi*. (= Abildgaardia Eragrostis, *Vahl*; *Benth. Fl. Hongk.* 390.)

***Fimbristylis cinnamometorum**, *Kth.*; *Thw. Enum. Pl. Zeyl.* 434. (=Abildgaardia fusca, *Nees*; *Benth. Fl. Hongk.* 390.)

It is impossible to retain *Abildgaardia* distinct as a genus from *Fimbristylis*, the only character by which it was known being the distichous scales, and *A. javanica*, Steud., and *F. connectens*, Thw., having an equal claim to rank in either group.

***Cladium chinense**, *Nees in Pl. Meyen.* 116. (=C. Mariscus, *Benth. Fl. Hongk.* 397.)

This appears to differ from the European species by the smaller spikelets, constantly trifid style, rugulose furrowed achene (the furrows are readily noticed when looked at from below), more slender habit, and narrower leaves. I do not think *Cladium* has any claim to be kept apart from *Rhynchospora* as a genus: *R. aurea* Vahl and *C. chinense* Nees, and *R. laxa* R. Br. and *C. mariscoides* Torr. are exceedingly like one another. Dr. Hooker again (Handb. N. Zeal. Fl. 304) unites *Baumea*, *Chapelliera*, and *Vin-*

centia with *Cladium*; and remarks that *Gahnia* (to which he reduces *Lampocarya*) differs rather in habit than structural characters.

***Arthrostylis chinensis**, *Benth.*

Glumes distichously imbricate, pale brown. Bracts usually shorter than the spikelets. Hypogynous bristles often present, and longer than the nut. Style long, 3-cleft at the apex, dark-coloured, very gradually thickened towards the base, and there separating at maturity. Nut white, trigonous, with three finely granulated raised bands running down the angles from the apex; the faces between marked with blunt protuberances so as to look like shagreen leather. Except that the style is articulated with the achene and falls off entirely, instead of leaving a more or less conspicuous persistent base, there is absolutely nothing to distinguish this genus from *Schœnus*, with which it entirely agrees in habit; and I have proposed their being united. (Seem. Journ. Bot. vii. 63.)

***Scleria radula**, *Hance in Ann. Sc. Nat. Par.* ser. 4, xviii. 232. (=S. lævis, *Retz.*, var. scaberrima, *Benth. Fl. Hongk.* 400.)

Appears to me abundantly distinguished by many marked characters.

***Scleria Harlandi**, *Hance in Ann. Sc. Nat. Par.* ser. 5, v. 248. (=Scleria purpurascens, *Benth. Fl. Hongk.* 400, but not of Steudel.)

***Panicum sarmentosum**, *Roxb.*

According to Prof. Grisebach (Fl. Br. W. Ind. 547), this is identical with *P. molle*, Sw., an obscure species. Spruce's Barra plant, distributed under the name of *P. Meyerianum*, Nees, and also referred here by Grisebach, seems to me quite different; but whether it be the same as the Kaffrarian grass (Fl. Afr. Austral. 32), I do not know.

49. **Panicum** (**Echinochloa**) **stagninum**, *Kœn.*; *Miq. Fl. Ind. Bat.* iii. 464.

In stagnant water. Diffused over India, Southern Asia, and North-eastern Africa.

50. **Garnotia drymeia**, *Hance in Ann. Sc. Nat. Par.* ser. 4, xviii. 233.

In moist shady woods. Occurs also on the adjacent continent, but is not known from elsewhere.

***Perotis longiflora**, *Nees.*; *Trin. Agrostid. call. rotund.* 20; *Steud. Syn.*

Pl. Gram. 186. (=P. patula, *Nees, ibidem.*—P. latifolia, *Ait.*; *Benth. Fl. Hongk.* 418.)

I consider this is truly distinct from the Ceylon and South-African *P. hordeiformis*, Nees, by its much longer spikelets and awns, and looser racemes. Steudel gives seven species of *Perotis*; but I believe the two just mentioned and *P. rara*, R. Br., are the only well-founded ones.

***Zoysia sinica,** *Hance in Seem. Journ. Bot.* vii. 167. (= Zoysia pungens, *Benth. Fl. Hongk.* 418.)

I consider this a very good species as compared with the true *Z. pungens*, Willd., from Ceylon and Australia.

51. **Saccharum procerum,** *Roxb. Fl. Ind.* i. 243; *Steud. Syn. Pl. Gram.* 406.)

In waste places, on a dry gravelly or sandy soil, but not common. Occurs on the mainland, near Canton, and also in Bengal.

52. **Arthraxon ciliare,** *Beauv.* (=A. japonicum, *Miq. Ann. Mus. Bot. Lugd.-Bat.* ii. 288.—Andropogon Retzii, *Steud. Syn. Pl. Gram.* 375.—A. submuticus, *eidem, l. c.* 382.—Pleuroplitis Langsdorffiana, *Trin.*; *Kunth, Enum. Plant.* i. 473.—Lucæa Langsdorffiana, *Steud. Syn. Pl. Gram.* 413.—Batratherum submuticum, *Nees.*—Lasiolytrum hirtum, *Steud. Syn. Pl. Gram.* 12.)

On bank-sides, but not a common grass in Hongkong. Abundant in many places on the adjacent mainland, and extending up the coast of China as far as Japan; occurs also in the mountainous regions of India. The group to which this pretty grass belongs seems to me a natural one, all the species having a very marked inflorescence; but Grisebach, following Trinius (Göttinger Nachrichten, Febr. 1868, 90), combines it with *Andropogon*. The present species varies a good deal in the number of spikes, the size, colour, and smoothness or roughness of the glumes, and absence or length when present, of the awns of the florets, and has been much misunderstood, as the above list of synonyms, which might doubtless be extended, will show. *A. nudum*, Wall. (*Pleuroplitis centrasiatica*, Griseb.), which is found in the Himalayas, Nipal, and the Songorian steppes, is very doubtfully distinct; and the two are combined by Regel (Trautvetter, Enum. Pl. Schrenk., contin. 4. 71). See the observations of Grisebach (Ledeb. Fl. Ross. iv. 478).

53. **Andropogon Bladhii,** *Retz*; *Roxb. Fl. Ind.* i. 259; *Steud. Syn. Pl. Gram.* 379; *Trin. Ic. Gram.* t. 325.

Struggling in hedges and on banks; common near Heongkong. Flowering in November and December. Found also in India and on the mainland.

54. **Andropogon punctatus,** *Roxb. Fl. Ind.* i. 264; *Nees in Pl. Meyen.* 187; *Trin. Ic. Gram.* t. 328.

In dry sandy places. In the mountainous parts of India, as far north as Kashmir and Kumaon, and also in South China.

***Andropogon brevifolius,** *Sw.?*

The Chinese grass is so different in all its proportions from the South-American one, that I do not believe they are conspecific.

55. **Anthistiria heteroclita,** *Roxb. Fl. Ind.* i. 249; *Steud. Syn. Pl. Gram.* 389, sub Andropogone.

Amongst grass. Gathered by me in November 1862. Found also in India.

***Ischæmum leersioides,** *Munro.*,

is, I think, much nearer to *I. falcatum*, Nees, than to *I. pectinatum*, Trin., of which Bentham suggests that it may prove to be a variety.

56. **Aristida Cumingiana,** *Trin. and Ruprecht, Spec. Gram. Stipac.* 141. (=Chætaria trichodes, *Nees in Hook. Kew Gard. Miscel.* ii. 101.)

Thickly carpeting the precipitous sides of the trap-rock gully between the villages of Aberdeen and Heongkong, where the stream runs into the sea and the highroad is below the level of high water; first discovered by Mr. Sampson in October 1868; also since met with on the summit of the White-Cloud hills outside Canton. An exceedingly pretty grass, hitherto found only in the Philippines, unlike any other Asiatic species, but closely allied to the South-American *A. capillacea*, Lam. Steudel, with characteristic negligence, after copying Trinius and Ruprecht's character (Syn. Pl. Gram. 140), quotes *Chætaria trichodes*, Nees, as a synonym, with Cuming's n. 671 for the type, and afterwards in the same page describes this as a separate species, with a reference to Hooker's Journal, where the same number is given. It is to be regretted that the Russian monographers could devise no better arrangement of this large genus than a geographical one.

57. **Leersia hexandra,** *Sw.*; *Steud. Syn. Pl. Gram.* 2.

In ditches and wet places, not uncommon. Widely disseminated over the warmer regions of the globe. The genus, remarkable for containing mono-, di-, tri-, and hexandrous species, only differs from *Oryza*, with which it is combined by Alex. Braun, by the entire suppression of the glumes.

58. **Eriachne chinensis,** *Hance in Ann. Sc. Nat. Par.* ser. 4, xv. 228. (=E. Hookeri, *Munro, ined., in herb. Hook.*)

On the summits of hills, growing in profusion in company with *Apocopis Wrightii*, Munro, but very local. This elegant grass is very abundant at Whampoa, where it was first discovered in September 1751 by Osbeck, who mentions it (Reise nach Ostindien u. China, 287) under the name of *Aira seminibus hirsutis, aristis terminalibus flore longioribus*; and, according to General Munro, (Journ. Linn. Soc. vi. 42), a specimen from him exists in Linnæus's herbarium marked *Aira montana.* The species is also found in Assam, Tenasserim, and, I believe, in Chittagong.

59. **Centotheca lappacea,** *Desv.*; *Kunth, Enum. Plant.* i. 366; *Steud. Syn. Pl. Gram.* 116. (=Melica refracta, *Roxb. Fl. Ind.* i. 327, from the character.)

Not uncommon in damp woods and shaded ditches. Widely spread over continental and insular India, the Malayan archipelago, Philippines, Australia, and the Pacific islands.

***Eragrostis bahiensis,** *Schrad. teste Trin.*; *Kunth, Enum. Plant.* i. 341; *Griseb. Fl. Brit. W. Ind.* 532. (= E. Brownei, *Nees*; *Benth. Fl. Hongk.* 432.)

It would appear that the South-Chinese species of this genus must be reduced. *E. geniculata*, Nees, is the most distinct-looking of all, from its compact spiciform inflorescence; but this occasionally breaks up into separate branches, and it is then not always possible to distinguish it from *E. zeylanica*, Nees, in its normal state as unlike as can be, but of which depauperate specimens with approximate and abbreviated panicle-branches show at once how easy is the transition between the two. Again, the panicle of *E. orientalis*, Trin., is sometimes quite as spreading, the pedicels as long, and the leaves as flat as in *E. pilosissima*, Link; and there is then no character I can detect to distinguish them by, except the hairiness or smoothness of the leaves and vaginæ. Mr. Bentham describes the glumellæ of *E. orientalis* as "very obtuse;" but in a specimen determined by General Munro, as well as in all others I have examined, I find them more acute than in *E. bahiensis*; and Nees himself distinctly states (Pl. Meyen. 206) that they are acute. This, however, is probably a variable character; for, except in the blunt lower glumella, I can find nothing to distinguish the Kordofan *E. tremula*, Hochst., from *E. orientalis*. *E. bahiensis*, in its usual state, has, with its compactly arranged deep-coloured wider spikelets, a greater resemblance to *E. megastachya*, Link, than to *E. orientalis*; but I have found specimens which I could not satisfactorily refer to one rather than the other. And even so eminent an authority as General Munro seems to have been beset by similar difficulties; for a specimen of mine labelled in his handwriting *E. zeylanica*, and enumerated as such in the 'Botany of the Voyage of the Herald,' is certainly only *E. bahiensis*, a species which, by the way, is not mentioned in that work.

***Arundinaria sinica**, *Hance in Ann. Sc. Nat. Par.* ser. 4, xviii. 235. (=A. Wightii, *Benth. Fl. Hongk.* 434, but not *A. Wightiana*, Nees. —A. longiramea, *Munro in Trans. Linn. Soc.* xxvi. 19.)

Not known out of the island. My name has several years' priority over that of Munro.

***Dendrocalamus latiflorus**, *Munro in Trans. Linn. Soc.* xxvi. 152, t. 6. (=Bambusa verticillata, *Benth. Fl. Hongk.* 434, but not of Willdenow.)

Only found hitherto in China and in Formosa. This fine species, the "Great Bamboo" of the Chinese, which has culms about 40 feet high, instead of 7 as stated by Munro, flowers, *favente Jove*, annually without dying down or being apparently weakened. It is the species generally employed here for scaffolding and where strong large-sized stems are required; and its young shoots are extensively used as a vegetable.

***Bambusa tuldoides**, *Munro in Trans. Linn. Soc.* xxvi. 93. (=B. tulda, *Benth. Fl. Hongk.* 434, but not of Roxburgh.)

Occurs also on the adjacent continent and in Formosa.

60. **Bambusa flexuosa**, *Munro in Trans. Linn. Soc.* xxvi. 101.

Not so common in Hongkong as on the continent, but found here and there. Not known out of China. A curious and distinct species, forming dense clumps, apparently flowering less regularly than *Dendrocalamus latiflorus*, but also not dying afterwards. Both flower in the winter months.

Having to add fifteen ferns to those enumerated by Mr. Bentham as inhabiting Hongkong, and the generic nomenclature I should employ not being consonant with that of the flora, I am compelled to reduce the whole of the species in that work to an harmonious system. To this end I have, so far as possible, endeavoured to name them according to the views of the late Professor

Mettenius, which, as first set forth in his 'Filices horti Lipsiensis' and subsequently amended in various other publications, seem to me, with some slight modifications (such, *e. g.*, as the reduction of *Phegopteris* to *Aspidium*, and the separation of *Athyrium* from *Asplenium*), to be by far the most philosophical and carefully considered of any yet propounded—the larger genera (so much broken up by Fée, J. Smith, Moore, and others) being preserved, and all based on definite characters employed uniformly throughout the whole classification—a plan which ensures, as far as practicable, the equality in rank or value of the genera.

61. **Trichomanes latemarginale,** *Eaton*; *Hook. and Bak. Syn. Fil.* 79.

Discovered by the late Dr. Harland and myself, in July 1854, growing along with *Utricularia Harlandi*, Oliv., on the perpendicular wall-like sides of a narrow ravine near Causeway Bay. Not known from elsewhere.

***Chrysodium vulgare,** *Fée, Hist. Acrostich.* 97. (=Acrostichum aureum, *Linn.*; *Benth. Fl. Hongk.* 443.)

***Chrysodium Harlandi,** *mihi.* (=Acrostichum decurrens, *Benth. Fl. Hongk.* 443; but not of Desvaux.—A. Harlandi, *Hook. Sp. Fil.* v. 274.)

***Chrysodium repandum,** *mihi.* (=Acrostichum repandum, *Blume*; *Benth. Fl. Hongk.* 444.)

62. **Polybotrya marginata,** *Blume*; *Presl, Tent. Pteridogr.* 231; *Fée, Hist. Acrostich.* 75. (=Acrostichum (Egenolfia) appendiculatum, *Willd.*; *Hook. Sp. Fil.* v. 251.)

In shaded ravines, but not very common. Occurs throughout the entire Indian continent, in Ceylon, the Malayan and Philippine islands, and Cochinchina. The late Prof. Mettenius (Fil. Hort. Lips. 24) was disposed to refer this to *Lomariopsis*; but he included some of the forms belonging to it in *Polybotrya*.

***Tænitis microphylla,** *Mett. msc. in Kuhn, Fil. Afr.* 58. (=Drymoglossum carnosum, *Hook. part.*; *Benth. Fl. Hongk.* 444.)

Mr. Baker remarks (Syn. Fil. 397) that this differs from *T. carnosa* by the sporangia being mixed with hairs instead of peltate scales; but this is not the case in any Japanese or South-Chinese specimens I have examined. It is obviously impossible to retain *Drymoglossum* as a genus.

***Lindsaya tenuifolia,** *Mett. in Ann. Sc. Nat. Par.* ser. 4, xv. 64. (=Davallia tenuifolia, *Sw.*; *Benth. Fl. Hongk.* 462.)

I quite concur with Mettenius in thinking that the affinity of this species and its allies, forming Presl's section *Odontosoria*, and Fée's genus *Stenoloma*, is with *Lindsaya* instead of *Davallia.* See the remarks of Prof. Grisebach (Fl. Brit. W. Ind. 661) who arrives at a precisely similar conclusion, though referring these species to *Davallia* instead of *Lindsaya.* The late Sir W. Hooker described *L. oblongifolia*, Reinw., under both genera.

***Cheilanthes hirsuta**, *Mett. Monogr. Cheil.* 25. (=Notholæna sulcata, *Link.*; *Benth. Fl. Hongk.* 449.)

63. **Pteris pellucida**, *Presl*; *Hook. and Bak. Syn. Fil.* 154.

Gathered once only, by Dr. Harland and myself, in October 1856, on the steep grassy face of Victoria Peak. Native likewise of the province of Fokien, the mountainous regions of India, Ceylon, the Philippines, and the Malayan peninsula.

64. **Asplenium Hansei**, *Bak. Syn. Fil.* 208.

On hill-sides, amongst grass, very rare. Discovered by me in November 1857. I have not seen the Hongkong form from elsewhere. Dr. Kuhn unites my *A. crinicaule* with this (Bot. Zeit. 1869, 131); but I think they are distinct. I refer De Grijs's Fokien and Sampson's Kwangtung specimens to *A. crinicaule*, which varies a good deal, and sometimes very closely resembles *A. anisodontum*, Presl.

***Asplenium laserpitiifolium**, *Lam.*,

united by Bentham with *A. cuneatum*, Lam., is recognized by Mettenius, Kuhn, and most pteridologists, as a true species. Both occur in Hongkong.

***Asplenium lineolatum**, *Mett. in Miq. Ann. Mus. Bot. Lugd.-Bat.* ii. 238. (=Asplenium fraxinifolium, *Wall.*; *Benth. Fl. Hongk.* 451.)

***Asplenium latifolium**, *Don*; *Bak. Syn. Fl.* 239. (=Asplenium dilatatum, *Hook. part.*; *Benth. Fl. Hongk.* 452.)

The simply-pinnate fern with subcoriaceous fronds, alluded to by Mr. Bentham under *A. silvaticum*, is, I think with Sir W. Hooker, rather a variety of the present species.

65. **Asplenium speciosum**, *Mett.*; *Bak. Syn. Fil.* 235.

I insert this on Mr. Baker's authority, not having, to the best of my recollection, seen a Hongkong specimen.

66. **Hypolepis punctata**, *Mett. msc. in Kuhn, Fil. Afr.* 120. (=Polypodium rugulosum, *Labill.*; *Hook. Sp. Fil.* iv. 272.)

Rare in Hongkong. Recorded in the 'Botany of the Herald,' but accidentally omitted by Mr. Bentham. I have a characteristic specimen gathered by myself still at hand. An ambiguous fern as to position and affinities (*Cfr.* Hook. fil. Handb. N. Zeal. Fl. i. 361, 381; Griseb. Fl. Brit. W. Ind. 667; Mett. Monogr. Phegopt. 13), diffused over most of the warmer parts of the globe.

***Aspidium urophyllum**, var. **uniseriale**, *mihi.* (= Polypodium granulosum, *Benth. Fl. Hongk.* 459, but not of *Presl.*)

***Aspidium simplex**, *mihi.* (= Meniscium simplex, *Hook.*; *Benth. Fl. Hongk.* 457.)

I cannot keep *Phegopteris*, to which Mettenius had already reduced *Meniscium* (Fil. Lechler. ii. 20), separate from *Aspidium*, of which it does not even form a natural section, the different species being very variously related. Abundant evidence exists that many usually nudisorous species are occasionally indusiate, so that I cannot accept this as a generic character †. All differ from *Polypodium* by the continuity of rhizome and stipes.

***Aspidium filix-mas**, *Sw.*; *Milde, Fil. Europ.* 118. (= Aspidium Championi, *Benth. Fl. Hongk.* 456.)

Most of the South-Chinese specimens are referable to the variety *paleaceum*; but others belong to the common European form.

67. **Aspidium erythrosorum**, *Eaton.* (= Nephrodium erythrosorum, *Hook. Sp. Fil.* iv. 120, t. 253.)

Not common on the island, and found also on the mainland near Canton, in Fokien, the islands of the Korean Gulf, and Japan.

***Aspidium varium**, *Sw.*; *Hook. Sp. Fil.* iv. 30, t. 226. (= A. opacum, *Hook.*; *Benth. Fl. Hongk.* 456.)

Distinct as good typical specimens of the above three ferns appear (and the last is generically separated from the other two by Mr. Baker), they yet run together so imperceptibly that examples occur which cannot be referred with certainty to either, and I do not doubt that they are all forms of one species. I may add that the bright red hue of the indusia in *A. erythrosorum* is not a constant character, and is sometimes equally conspicuous in *A. coniifolium*, Wall. *A. lacerum*, Sw., referred to *A. filix-mas* by Sir W. Hooker, appears to me a well-marked plant, with a not very distant relationship to *A. acrostichoides*, Sw. The inconstancy of form of the indusium in most of the species of this group sufficiently shows how unstable a genus *Nephrodium* is, though retained by both Hooker and Baker. It is, in fact, not a natural subgenus or section; for its adoption as such removes allied species to a distance from each other.

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† "*Phegopteridis* species quasi per vim a proximis cognatis, quæ nunc in genere *Aspidio* sunt, diremtæ sunt. Mentionem faciam solum *Ph. cochleatæ* et *pycnolepidis*, quæ in distributione naturali juxta *Aspidium vestitum* ponendæ sint, ita ut in quibusdam generibus indusii absentia vel præsentia non nisi ad vicinas species secernendas adhiberi possit." KUHN, *Fil. Afr. introd.* 4.

68. **Aspidium amabile,** *Blume*; *Hook. Sp. Fil.* iv. 25, t. 225.

I have specimens from the mainland immediately opposite Hongkong, where I believe it occurs also. A native likewise of Nipal, Ceylon, the Malayan isles, Formosa, and Japan.

***Aspidium uliginosum,** *Kze.*; *Mett. Fil. Hort. Lips.* 94. (=Polypodium tenericaule, *Wall.*; *Benth. Fl. Hongk.* 459.)

***Aspidium calcaratum,** *Blume.* (=Nephrodium calcaratum, *Hook. Sp. Fil.* iv. 93.—Aspidium ciliatum, *Wall.*; *Benth. Fl. Hongk.* 455.)

***Aspidium glanduligerum,** *Kze.*; *Mett. Monogr. Aspid.* 86. (=A. Thelypteris, *Benth. Fl. Hongk.* 475, but not of *Linnæus.*—Nephrodium gracilescnes, *Hook. Sp. Fil.* iv. 93, but not *Aspidium gracilescens* of Blume.)

69. **Aspidium sophoroides,** *Sw.*; *Mett. in Miq. Ann. Mus. Bot. Lugd.-Bat.* i. 231. (=Nephrodium sophoroides, *Desv.*; *Bak. Syn. Fil.* 289.)

Not very common. Extends along the coast of China, and occurs also in Formosa, Loochoo, and Japan.

***Aspidium latipinna,** *mihi.* (=A. molle γ. paucisorum, *Hook. and Arn. Bot. Beechy*, 256.—A molle, var. latipinna, *Benth. Fl. Hongk.* 455.—Nephrodium latipinna, *Hook. and Bak. Syn. Fil.* 392.)

Common in the island and, as I can testify from many years' observation, very constant in character, so that I have never seen reason to doubt its specific rank. Occurs also on the mainland, and in Java.

70. **Aspidium heterocarpon,** *Blume*; *Mett. in Miq. Ann. Mus. Bot. Lugd.-Bat.* i. 233.

Occurs also in Java, Sumatra, and Borneo.

***Aspidium subtriphyllum,** *Hook. Sp. Fil.* iv. 52. (=Polypodium subtriphyllum, *Hook. and Arn. Bot. Beechey*, t. 50.—Aspidium trifoliatum, *Benth. Fl. Hongk.* 454, part., but not of *Swartz.*)

71. **Aspidium Leuzeanum,** *Kze.*; *Mett. Monogr. Aspid.* 116.

An uncommon fern in Hongkong, found also on the Chinese mainland, in the mountainous regions of India, the Malay archipelago, the Philippines, and some of the Pacific isles.

72. **Aspidium devexum,** *Kze.*; *Mett. in Miq. Ann. Mus. Bot. Lugd.-Bat.* i. 237. (=A. intermedium, *J. Sm.*; *Mett. Monogr. Aspid.* 119.—A. giganteum, var.? minor, *Hook. Sp. Fil.* iv. 50.—A. membranaceum, *Hook. Sp. Fil.* v. 105.)

Found also on the adjacent continent, extending into the extreme west of the empire; occurs likewise in Java, the Philippines, and Ceylon. Mr. Bentham unites *A. intermedium,* J. Sm., with *A. subtriphyllum,* from which it is altogether different. I have the distinct authority of the late Professor Mettenius and Dr. Max Kuhn for the Chinese fern being referable to Kunze's species, as shown by his herbarium.

***Polypodium lineare,** *Thunb.*; *Mett. in Miq. Ann. Mus. Bot. Lugd.-Bat.* ii. 224. (=P. Wightianum, *Wall.*; *Benth. Fl. Hongk.* 458.)

***Polypodium ellipticum,** *Thunb.*; *Mett. in Miq. Ann. Mus. Bot. Lugd.-Bat.* ii. 225. (=Grammitis decurrens, *Wall.*; *Benth. Fl. Hongk.* 457.)

This is as inseparable from *Polypodium* as *Meniscium* is from *Aspidium*. Sir W. Hooker referred it to *Gymnogramme,* which, as limited by him, is a most heterogeneous assemblage. The true species of that genus have the stipes continuous with the rhizome.

***Polypodium superficiale,** *Blume*; *Hook. Sp. Fil.* v. 71. (=P. hymenodes, *Wall.*; *Benth. Fl. Hongk.* 458.)

***Polypodium varium,** *Mett. Monogr. Polypod.* 126. (=P. adnascens, *Benth. Fl. Hongk.* 458, but not of *Swartz.*)

***Nephrolepis hirsutula,** *Presl, Tent. Pteridograph.* 79. (=Aspidium exaltatum, *Benth. Fl. Hongk.* 453, part., but not of *Swartz.*)

The much denser indumentum, and longer, less falcate and less auriculate overlapping pinnæ, with the sori more crowded, and placed nearer the margin, seem to distinguish this specifically from *N. exaltata,* Schott.

***Nephrolepis tuberosa,** *Presl*; *Hook. Sp. Fil.* iv. 151, part. (=Aspidium exaltatum, *Benth. Fl. Hongk.* 453, part.)

The above two ferns are unquestionably quite distinct, and easily recognizable at sight, being quite dissimilar in appearance when alive: the pinnæ of the latter are not half as long, parallelogrammatic in outline, rigid, about the same length throughout the whole frond, and almost smooth, with submedian sori. *N. delicatula,* Dcne., looks different from this. So far as my observation goes, the root-fibres of the first are never, those of the latter invariably tuberiferous.

***Nephrolepis biserrata,** *Schott; Kuhn, Fil. Afr.* 155. (=N. acuta, *Presl; Hook. and Bak. Syn. Fil.* 301.—Aspidium biserratum, *Sw.; Benth. Fl. Hongk.* 454.)

73. **Davallia divaricata,** *Blume; Hook. and Bak. Syn. Fil.* 96. (=D. polyantha, *Hook. Sp. Fil.* i. 168, t. 59 A.)

Not common in Hongkong; found also in the mountainous regions of India and the Malayan archipelago. A very handsome fern, exceedingly like *D. elegans*, Sw., but readily distinguished by the intramarginal fructification.

74. **Microlepia marginalis,** *mihi.* (=Polypodium marginale, *Thunb. Fl. Jap.* 337.—Davallia villosa, *Wall.*, and D. calvescens, *Wall.; Hook. Sp. Fil.* i. 172, t. 48.)

Not uncommon in Hongkong, and found also on the Chinese main-land, in Japan, in the upper mountains of India, and in Ceylon.

***Microlepia polypodioides,** *Presl, Tent. Pteridograph.* 125. (=Davallia polypodioides, *Don; Benth. Fl. Hongk.* 461.)

This genus differs essentially from *Davallia* by its exarticulate stipes.

***Cibotium Barometz,** *J. Sm.; Moore, Ind. Fil.* 259. (=C. glaucum, *Benth. Fl. Hongk.* 460, not of *Hooker* and *Arnott.*)

***Gleichenia longissima,** *Blume; Mett. in Miq. Ann. Mus. Bot. Lugd.-Bat.* i. 48. (=G. excelsa, *J. Sm.; Benth. Fl. Hongk.* 442.)

75. **Selaginella.**

A fourth species of this genus, with a widely spreading and rooting stem, the leaves of which are all appressed, and giving out shortish branches, with flabellate or palmate divisions, roundish in outline, exists in my herbarium, gathered by the late Dr. Harland and myself. The late Sir W. Hooker determined it as *S. stolonifera*, Spring; but it is certainly different from Mr. Spruce's specimens from the Rio Uaupés and Rio Negro, distributed under that name; nor can I identify it with any Indian or Ceylon species in my possession. It is, however, only those who, like Prof. Alexander Braun, have made this exceptionally difficult and intricate genus the subject of profound critical study, who are competent to name these plants. Though united with *Lycopodium* in the 'Flora Hongkongensis,' *Selaginella* differs so essentially, by the possession of dimorphous sporangia, one kind containing macrospores, the other microspores, that A. Braun and

Mettenius consider it to form, with *Isoëtes,* the type of a distinct natural order; whilst Milde regards each of the three genera as constituting a distinct suborder of Lycopodiaceæ.

The Moss-flora of Hongkong does not appear to be at all rich. Mr. J. C. Bowring is, I believe, almost the only person who has paid any attention to the collection of these plants. The following brief and, no doubt, very imperfect list is compiled from a notice of Chinese Mosses published by Mr. Wilson in the seventh volume of Hooker's 'London Journal of Botany' (1848), and from Mr. Mitten's various important contributions to Bryology inserted in the 'Proceedings of the Linnean Society.' Messrs. Sullivant and Lesquereux's enumeration of the Mosses collected during the United States' North Pacific Exploring Expedition, published in the 'Proceedings of the American Academy,' probably includes a number of Hongkong species; but I have unfortunately been unable to get access to this. A list of Japanese Mosses, by M. Van der Sande-Lacoste, will be found in the second volume of the late Professor Miquel's 'Annales Musei Botanici Lugduno-Batavi;' and a proportion of these will doubtless occur in Hongkong.

Trematodon longicollis, Rich.
Leucoloma mollis, C. Müll.
Dicranum ? *nigrescens,* Mitten.
Didymodon proscriptus, Hornsch. var. ?
Leucobryum javense, Mitten.
—— *Bowringii,* Mitten.
Schistomitrium Gardnerianum, Mitten.
Calymperes moluccense, Schw.
—— *serratum,* Al. Br.
Physcomitrium acuminatum, Br. and Sch.
Macromitrium nipalense, Schw.
—— *spathulare,* Mitten.
Meteorium lanosum, Mitten.
Stereodon micropelma, C. Müll., var.
Neckera dendroïdes, Sw.
Anomodon devolutus, Mitten.
Leskea microphylla, Sw., var.
Fissidens nobilis, Griff.
—— *adiantoïdes,* Linn.
—— *Zippelianus,* Dzy. & Molk.

Remarks on *Dolichos uniflorus*, Lamarck. By N. A. Dalzell, Esq. (Communicated by J. D. Hooker, M.D., V.P.L.S.)

[Read November 16, 1871.]

Mr. Bentham has well observed * that the genus *Dolichos* had been, up to the publication of DeCandolle's 'Prodromus,' a receptacle for many of the obscure Phaseoleæ; and I may add, for long after that period; for, of the nine species published in the 'Prodromus' of Wight and Arnott, about one half belong to other genera; and among these I venture to place *Dolichos uniflorus*, Lam. This is by no means an obscure plant, being extensively cultivated in India under the name of Kooltee, and used for feeding cattle. Up to the present time every author appears to follow Lamarck in placing this plant under *Dolichos.*

The published descriptions of this plant are not altogether accurate. Roxburgh, in his 'Flora Indica,' states that two bracts press the calyx laterally, and that the upper lip of the calyx is emarginate; while Wight and Arnott describe the calyx as deeply bilabiate, and the stigma as glabrous. The bracts do not press on the calyx, but are scattered on the pedicels; the upper segment of the calyx is shortly split into two setaceous teeth; and the vexillum is obovate-oblong. There is not the slightest approach to a bilabiate form in the calyx; and the stigma is surrounded, not exactly by hairs, but by tubes incurved at their apex, not unlike the tentacula of some Actinia. Roxburgh alludes to the absence of callosities on the vexillum; and there are certainly no callosities properly so called; but there are two very narrow membranous expansions, with free margins, occupying the usual position of the callosities; these appear, however, to be of a peculiar nature, and unlike any thing I have seen in the Leguminosæ.

The simple unknotted rachis, the calyx with long, slender, subulate teeth, much longer than the tube, the narrow membranous vexillum without callosities, auricles, or thick-edged claws, the narrow straight linear wings, slightly curved keel, the hitherto unobserved adherence of the tenth stamen to the staminal tube, the long, filiform, slightly curved, glabrous style, and the absence of a glandular sheath round the base of the ovary—all these are characters which remove the plant far from *Dolichos*, and place it in the Glycineæ, and, in my opinion, unite it most closely with the *Johnia* of Wight and Arnott, the *Glycine javanica* (*japonica* ?) of Linn.

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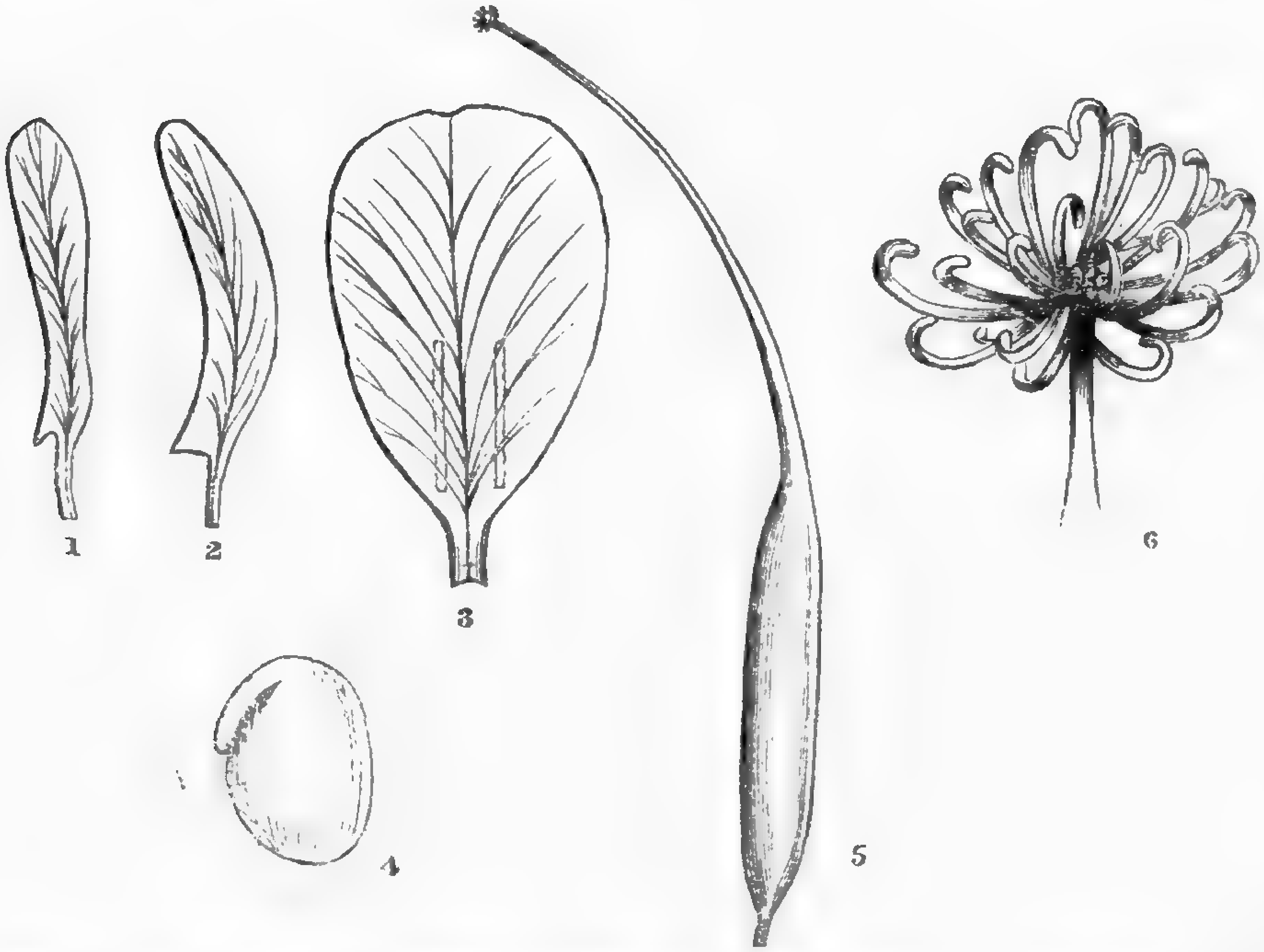
* Proceedings of the Linnean Society, vol. viii. p. 263.

In 1860 I entered this plant in the Bombay flora as a species of *Johnia*; and after a recent careful examination I remain of the same opinion. *Uniflorus* is an unfortunate name, as it has always more than one flower in the axil, and often as many as five; but I suppose it must be retained according to the rules of botanical etiquette. Wight and Arnott describe the seed of their *Johnia* as peritropal; the seed of the plant under notice is remarkably so, the radicle being unusually long, and lying closely parallel with the length of the seed.



Parts of the flower of *Dolichos uniflorus*, Lam., much magnified. 1, ala; 2, keel; 3, vexillum; 4, seed, with testa removed; 5, ovary; 6, stigma, highly magnified.

I propose therefore the name of *Glycine* (*Johnia*) *uniflora* for the Kooltee.

Milbrook House, Carlisle,
October 12, 1871.

On the Floral Structure of *Impatiens fulva*, Nuttall, with especial reference to the Imperfect Self-fertilized Flowers. By ALFRED W. BENNETT, M.A., B.Sc., F.L.S.

[Read November 16, 1871.]

(PLATE III.)

THE existence of inconspicuous self-fertilized flowers, extremely different from the large and conspicuously coloured ones, in at least three species of *Impatiens*, *I. noli-me-tangere*, Linn., *I. fulva*, Nutt., and *I. parviflora*, DC., is well known to Continental and American botanists, but appears to have received but little notice from most English observers; at least I find no detailed description of such flowers in the majority of works on English botany, or our ordinary text-books, though they are referred to in Dr. Boswell-Syme's edition of Sowerby's 'English Botany,' and in Dr. Hooker's 'Student's Flora,' and Bentham's 'Handbook of the British Flora.' The first observation of these inconspicuous flowers appears to be due to Weddell, in the case of *I. noli-me-tangere*, whose description of them is published in Jussieu's 'Monographie des Malpighiacées' and in Mohl's account of every thing that was known with respect to this phenomenon down to 1863 (contained in his paper, "Einige Beobachtungen über dimorphen Blüthen," in the 'Botanische Zeitung' for that year), and is referred to by Hildebrand in his 'Geschlechter-Vertheilung bei den Pflanzen,' and by Professor Oliver, in a paper on "Dimorphic Flowers," published in the 'Natural History Review' for 1862; Professor Asa Gray, also, in his 'Genera Floræ Americæ boreali-orientalis,' describes them in his diagnosis of that genus, and gives an admirable drawing of both kinds of flowers in the case of *I. fulva*. To Dr. Torrey, however, appears to belong the credit of having first observed them in the American species, he having already mentioned them in his 'Flora of the State of New York.'

Having had the opportunity during the past autumn of observing tolerably accurately the habit and development of these minute or "cleistogenous" flowers (as they have been termed by a German writer) of *Impatiens fulva*, I am able to add a few particulars to those already published, which may be interesting as a contribution to our knowledge of the phenomena of cross-fertilization and self-fertilization. That the existence of these flowers should be unknown to those who have seen the plant only in the herbarium is not surprising, from a circumstance presently to be mentioned. The locality of the observations is one of its well-known habitats, the banks of the small but rapid stream the Tillingbourne, an affluent of the Wey, near the village of Shalford, in Surrey. Here it fringes the banks in great quantities every year, having apparently spread upwards from the Wey, a distance of from half a mile to a mile, notwithstanding the rapidity of the current, its seeds being doubtless carried by birds or other water-animals; for it appears to be strictly annual. My attention was first attracted to the subject by the great abundance of seed-vessels, notwithstanding the difficulty I had had in finding any of the flowers earlier in the summer, and the remark of a local naturalist that " it is one of those plants which bears seeds without producing any flowers."

Prof. Gray's description might be understood to imply that, in the earlier stages, the two kinds of flower-bud are identical, the difference in structure developing only after the premature fertilization of those which are not destined to produce conspicuous flowers. I believe, however, that the difference is original; at least, in the very earliest stage at which the buds are visible to the eye I could detect the external difference without difficulty. Figs. 1 & 2 represent the appearance of the flower-bud in both kinds of flowers at a very early stage, before the organs of reproduction are fully developed. The bud of the conspicuous flower (fig. 1) has the apex of the two exterior (lateral) sepals hooked, while in that of the inconspicuous flower (fig. 2) it is straight, the two buds at this stage being nearly equal in size. The removal of the two exterior sepals shows a still greater difference (figs. 3, 4), the spurred posterior sepal, or nectary, being very easily seen in the former case (fig. 3), while in the latter (fig. 4) the interior whorls of organs are, as described by Prof. Gray, nearly regular, but never developing beyond a very minute size.

The arrangement of the stamens in the conspicuous flowers, I find to differ slightly from Prof. Gray's generally very accurate description. The filaments, as shown in fig. 5, are coherent in their lower part, but free above, the anthers being again coherent. A single stamen, showing the mode of dehiscence and escape of the pollen, is shown in fig. 6. The pollen is disharged in dense white masses. The anterior stamen is decidedly longer than the posterior, and is bent almost at right angles in its free portion, the point of the pistil being inserted into the bend. Springing from the posterior portion of the tube formed from the coherent lower portions of the filaments, is a membranous kind of wing, closely adpressed to the pistil—this wing, together with a slight projection from the anterior filament, completely closing in and covering the pistil. A section of the staminal tube, with the pistil, is shown at fig. 7, and, after the removal of the pistil, at fig. 8.

The development of the inconspicuous or "cleistogenous" flowers is entirely different. As already stated, the bud remains much much more minute, and the calycine and corolline whorls are much more regular. The buds never open, but are pushed off from the already fertilized ovary in the form of a cap, as shown in fig. 9. This takes place at so early a stage that it is very difficult to detect the process; indeed I examined hundreds of specimens without finding more than three or four instances of the half-expelled cap, which closely resembles the calyptra of a moss. The structure of the stamens is very different from that found in the conspicuous flowers. They are equal in length, the filaments free for their whole length, strap-shaped, and, although in the earliest stage straight (fig. 10), become afterwards remarkably contracted (fig. 11). The anther is scarcely broader than the filament; and the quantity of pollen is exceedingly small compared with that in the conspicuous flowers. Owing to the very obscure nature of the stigmatic surface, the exact period of impregnation is very difficult to determine; nor could I detect any dehiscence of the anthers for the discharge of the pollen. Prof. Oliver informs me that it is very commonly the case in closed self-fertilized flowers for the pollen-tubes to penetrate the substance of the anther itself. The mode in which the cap is thrown off presented a great difficulty to my mind. I find this to take place almost invariably at the very earliest stage with the first growth of the pistil (though this does not appear to be so much the case with the other species grown in this country, nor with *I. fulva* in America, to judge from Prof. Gray's description and drawing). Owing to the length of the petioles, the flowers are generally found beneath the leaves, so that the caps are lost. In a few cases, however, where there had been a distortion of the petiole, or some other cause of disturbance of the ordinary arrangement, a careful search discovered cast-off caps in positions which suggested that they had been thrown off with some violence, from some cause comparable, possibly, to the elasticity of the valves of the ripe capsules. I am inclined to think, though further observation is necessary before this can be considered determined, that the filaments of these inconspicuous flowers are elastic, the different positions in which they are found at different stages of the bud being due to their efforts to throw off the cap.

With regard to the fertilization of *Impatiens fulva*, there can be no doubt that self-impregnation takes place in the "cleistogenous" flowers at a very early period, fruitful capsules appearing almost invariably to result from them. The conspicuous flowers are stated by all observers to be usually barren, though undoubtedly they sometimes produce seed-vessels; and, as far as I could observe, when this is the case the capsules contain the same average number of seeds as do those produced from the "cleistogenous" flowers. How the impregnation of these is effected I have been unable to determine. The arrangement of the stamens and the wing-like membrane before described appear to render self-fertilization absolutely impossible; and the singular part of these provisions is, that they do not seem to be constructed to favour cross-fertilization, but absolute sterility, as far as these flowers are concerned. The pendent position of the flowers causes the anthers to open with the opening directed downwards; and the inequality of the filaments already described occasions the line of the opened anthers to be horizontal. The whorl of stamens is very easily detached bodily, so as to expose the stigma; but I have failed to discover that this ever takes place spontaneously; the whole flower drops together, the pistil generally being detached at the same time; and were the pistil left behind, there would be nothing to cause insects to be attracted to it; and I can only suggest that the pollen is brought to it by the chance action of the wind. I have never seen any insect visit the *Impatiens*; but it would seem very strange if so handsome and complex a flower has been constructed without any benefit thereby resulting to the species. It would be interesting to know whether it is visited by insects in its native country. The only hint I can find on this subject is in a very old and scarce book, 'New England's Rarities discovered in Birds, Fishes, Serpents, and Plants of that Country,' &c. By John Josselyn, Gent., London, 1675 *. "The Humming-bird Tree" (the drawing which accompanies it shows the plant described under this title to be *Impatiens fulva*). "This plant the Humming-bird feedeth upon, it groweth also in wet grounds, and is not at its full growth till July. It is garnished at the top with many dangling yellow flowers of a bright yellow colour." If this statement be correct, the manner in which the flower of the *Impatiens* is suspended appears admirably adapted for the Humming-bird to insert its head into the horizontal cornucopia-shaped "nectary" or posterior sepal, in doing which it would be almost certain to brush its head with sufficient force against the stamens to cause them to become detached, carrying with them the membrane which protects the stigma. But this can only be conjecture.

As to the relative abundance of the two kinds of flowers, and the time of the year at which they appear, I have never found the two kinds on the same branch, occasionally on different branches of the same plant, but more often on separate plants. This would account for the fact that the inconspicuous flowers are not to be found in herbaria. In the case of *I. noli-me-tangere*, Mr. Bentham and Dr. Boswell-Syme describe the two kinds of flowers as growing intermixed in the same raceme, although this is not borne out by Dr. Syme's own drawing. In the early part of September I found the inconspicuous-flowered plants to outnumber those with conspicuous flowers, certainly in the proportion of twenty to one. Walking for half a mile along both banks of the stream, in some places thickly fringed with the plant, I had some difficulty in finding thirty or forty specimens for the herbarium. The two kinds of plants grow, however, completely intermixed. Prof. Asa Gray states that "the minute fertile flower-buds begin to be produced earlier than the ordinary blossoms." Weddell, on the other hand, in the case of *I. noli-me-tangere*, asserted the inconspicuous flowers to be the latest, which assertion Mohl takes to be a *lapsus calami*, he having found in June abundance of these, while no trace of the more conspicuous flowers was to be found—whereas in September the latter were abundant, while the former had entirely disappeared. My own observation of *I. fulva* would lead me to suppose that the two kinds of flowers are absolutely synchronous.

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* Quoted in the 'Proceedings of the Essex Institute' (Massachusetts) for 1857.

I have never noticed the least indication of any intermediate condition between the two kinds of flower, as is stated to occur in some species of *Oxalis* and *Campanula*.

I have been unable this year to make similar observations on *Impatiens noli-me-tangere* and *I. parviflora*. Plants of the former, observed in the Botanic Gardens at Oxford on the last day of September, had abundance of the "cleistogenous" flowers with half-expelled corolla-cap, while scarcely any of the perfect flowers were to be met with, and those on different plants.

Mr. Darwin has kindly permitted me to append to this paper the following remarks with which he has favoured me:—"I am glad you have drawn attention to the difference in the bud-state of the perfect and imperfect flowers; for I remember, many years ago, objecting to Asa Gray that he considered the imperfect flowers (not, I think, in the case of *Impatiens*) arrested buds, and I maintained that their structure had been specially modified for their functions. From observations by myself in 1863, I find I was struck with the small size of the anthers, and the very small quantity of pollen. The grains are of the same diameter as in the perfect flowers, but they appeared to be more unequal in size. I distinctly saw pollen-grains protruding from the grains *whilst within the anthers*, and penetrating the stigma. I cannot believe that I could have overlooked the facts of the anthers not dehiscing. I do not mention in my notes that the pollen-grains are tied together by threads, as I do in the case of the pollen of the perfect flowers. I speak of the nectary in the cleistogenous flowers as a mere rudiment. From the fact of the nectary in the perfect flowers containing nectar, and from the pollen-grains being tied together by threads, I cannot doubt that they are crossed by insects, and I am almost certain that they are frequently visited by humble-bees. The structure of the flowers seems to me so well adapted for crossing, that I expected that the perfect flowers would be sterile without the aid of insects. In this I was quite wrong, as the perfect flowers, when protected, produced pods. Eleven such pods from perfect flowers, *spontaneously* self-fertilized, yielded on an average 3·45 seeds. I carefully brushed away the pollen from some of the perfect flowers, and fertilized them with pollen from a *distinct* plant, but got only three pods, containing, to my surprise, only 2, 2, and 1 seed. I attributed this poverty at the time to this plant probably requiring repeated doses of pollen, as is certainly sometimes the case."

To this I may append some remarks by Prof. Asa Gray in an article on "Dimorphism in the Genitalia of Flowers," in Dr. Seemann's 'Journal of Botany,' vol. i. p. 147, quoted from the 'American Journal of Science and Art,' vol. xxxiv., with corrections by the author:—"The second case, which belongs to structurally hermaphrodite flowers, is practically the reverse of the first. It is the case in which, besides the normal flowers of the species, which, for the most part, are rarely or sparingly fertile, other flowers are produced which never open, their development being, as it were, arrested in the bud, but which are very prolific of seed. Here the stigma is, and must needs be, fertilized by pollen from anthers of the same flower, the two being shut up together in the same closed bud. The acaulescent violets and the common wild species of *Impatiens* are good examples of this kind. In fact, impregnation is effected, as it were, in the early bud, wherefore we have indicated these as cases of precocious fertilization. Here the pollen is unusually active, sending out its tubes while still in the anther, and thereby, as in *Impatiens* &c., attaching the anthers to the stigma. We leave it to Mr. Darwin's sagacity to ascertain the end in the opposite case, noting that here the mostu ndoubted close fertilization for infinite generations shows no apparent tendency towards sterility, but rather the contrary."

EXPLANATION OF PLATE III.

Fig. 1. Bud of conspicuous flower, early stage.
    a. Apex of lateral sepals.
2. Bud of inconspicuous flower, early stage.
    a. Apex of lateral sepals.
3. Bud of conspicuous flower, lateral sepals removed.
    a. Spur of posterior sepal.
4. Bud of inconspicuous flower, lateral sepals removed.
5. Andrœcium from conspicuous flower.
6. Single stamen from conspicuous flower.
7. Andrœcium from conspicuous flower, cut open to show position of pistil.
    a. Membranous wing attached to posterior filaments.
    b. Projection from anterior filament.
8. Andrœcium from conspicuous flower, pistil removed.
9. Calyx and corolla partially detached from pistil of inconspicuous flower.
10. Stamen from inconspicuous flower, early stage.
11. Stamens from inconspicuous flower, later stage.

Note on *Amomum angustifolium*, Sonnerat.

By DANIEL HANBURY, Esq., F.R. & L.S.

[Read December 7, 1871.]

THE fruits which I now lay before the Society are those of *Amomum angustifolium*, Sonnerat, ripened in my hothouse at Clapham during the past autumn.

This species of *Amomum* was collected by Sonnerat in Madagascar, and described and figured in his 'Voyage aux Indes Orientales et à la Chine,' published in 1782. It was cultivated in the Calcutta Botanical Garden by Roxburgh, who states that plants of it were brought thither from Mauritius in 1802. An excellent coloured drawing is in the Roxburgh Collection now at Kew.

Bojer, in his 'Hortus Mauritianus,' published in 1837, mentions, as occurring in Mauritius, a plant which he calls *Amomum nemorosum* or *Longouze*. That this is the same species as the *A. angustifolium* of Sonnerat, I have ascertained by means of a good suite of specimens and coloured drawings transmitted to me several years ago by M. Emile Fleurot, of that island. Bouton, in his 'Medicinal Plants of Mauritius' (1857), assigns to the *Longouze* its correct name of *Amomum angustifolium*, Sonnerat. He asserts that it was brought originally from Madagascar; but in a letter to me under date May 6, 1861, he remarks that it "is positively a native of Mauritius, where it grows abundantly in marshy places."

My plant was raised from seeds sent from Mauritius to the Paris Exhibition of 1867. When it flowered, in June last, I was instantly struck with its perfect resemblance to the West-African *A. Danielli*, Hook. f.; and a careful comparison convinced me of the identity of the two species.

Of the West-African plant I have specimens from Sierra Leone, Monrovia, Grand Bassa, Cape Palmas, Akassa, Old Calabar, the islands of Fernando Po and St. Thomas, and the river Gaboon. It varies in the colour of the flower, which is sometimes of a uniform chrome-yellow, sometimes crimson, with the labellum of a yellow more or less pale, and sometimes, again, entirely crimson; but the shape of the flower, which is highly characteristic, presents but little variation. The scape is either short or long (that is, from 3 to 8 inches, or more), and varies greatly in the number of fruits which it bears. The fruits are moderately uniform in shape and size; they are filled with an acidulous pulp, in which are lodged numerous oblong, polished, brown seeds. Neither the fruit, nor foliage, nor the two combined afford positive characters for recognition of the species.

The synonymy of the plant may be given thus:—

Amomum angustifolium, *Sonnerat, Voyage aux Indes Orientales et à la Chine*, ii. 242, tab. 137; *Roxburgh, Flora Ind.*, ed. Carey, i. 39.
A. nemorosum, *Bojer, Hort. Mauritianus* (1837), p. 327.
A. Danielli, *Hook. f., Hooker's Journ. of Bot.* iv. (1852) 129, tab. 5 (sub nom. A. Afzelii); *Bot. Mag.* tab. 4764.
A. Clusii (?*Smith in Rees's Cyclopædia* (*Addenda*), xxxix.); *Bot. Mag.* tab. 5250.

Australian Fungi, received principally from Baron F. von Mueller and Dr. R. Schomburgk. By the Rev. M. J. Berkeley, M.A., F.L.S.

[Read January 18, 1872.]

The different fungi which are here characterized have been received sometimes in single specimens, sometimes in more or less numerous collections through a series of nearly twenty years. Many of them are either identical with European species, or so nearly allied that with dried specimens only, unaccompanied by notes or drawings, it is impossible to separate them; others are species which are almost universally found in tropical or subtropical countries; while a few only are peculiar to Australia—or are undescribed species, mostly of a tropical type. The collection, on the whole, can scarcely be said to be of any great interest, except so far as geographical distribution is concerned, as the aberrant forms are few.

Extreme conditions of weather are in general unfavourable to fungi, as their spawn is liable to be burnt up by drought, putrified by long-continued wet, or destroyed by frost. In the districts from which the greater portion have been derived, which are principally on the eastern and north-eastern regions, it may be safely concluded that we have a very fair sample of the mycology before us, though I believe that a great many curious things are still to be recorded from western Australia. I have appended the numbers under which the specimens were received, wherever it has been possible; some numbers, however, have been omitted, either from their never having been transmitted, or because the specimens were destroyed by insects before they arrived. The localities are given exactly as they were sent: some of them will be easily found in any tolerable map; but others I have not been able to verify.

1. AGARICUS (LEPIOTA) PROCERUS, *Scop.*

2. A. (LEPIOTA) EXCORIATUS, *Fr.*
Swan River, Wangaratta.

There is also a single specimen with much closer and more prominent warts, which does not agree with any thing in my herbarium; but I have not materials enough to describe it. It is possible that it may be a form of *A. acutesquamosus.*

3. A. (LEPIOTA) BECKLERI, *B.* Pileo subgloboso v. campanulato umbonato spongioso tomentoso versus apicem squamis parvis exasperato; stipite exaltato minutissime verrucoso glabrescente æquali, radice tuberiformi; annulo amplo deflexo; lamellis latis ventricosis postice attenuatis.
On burnt soil. Clarence River, *Beckler.*

Mycelium white. No. 11.

4. A. (LEPIOTA) BUBALINUS, *B.* Niveus; pileo ex ovato subhemisphærico expanso late umbonato, stipiteque intus arachnoideo deorsum incrassato-tomentosis; lamellis angustis.
On cow-dung. Oolingyarrak.

5. A. (LEPIOTA) MESOMORPHUS, *Bull.*
Shady banks of Moe River, April 24, 1863.

6. A. (LEPIOTA) ASPRATUS, *B.*, var., *Hook. Lond. Journ.* v. 6.
Clarence River (*Beckler*).

Phosphorescent.

7. A. (CLITOCYBE) LACCATUS, *Scop.*
Wangaratta.

8. A. (MYCENA) TUBERIGENA, *B.* Tenellus, albus; pileo convexo glabro striato; stipite capillari gracili e sclerotio elongato pallido nigrescente oriundo; lamellis breviter adnatis.
Wangaratta.
Pileus 1 line across, stem 1½ inch high.

9. A. (COLLYBIA) RADICATUS, *Relh.*
Fifth Creek.

10. A. (OMPHALIA) ONISCUS, *Fr.*
Gainsford (*G. Bowman*), 1869.

11. A. (OMPHALIA) PYXIDATUS, *Bull.*
Bugle Range, November. Apparently on dung.

12. A. (OMPHALIA) UMBELLIFERUS, *L.*
Mount Banks.

13. A. (OMPHALIA) SETIPES, *Fr.*, var. totus albus.
Shady places near mountain-rivulets, Goulbourn; Gipps Land, Latrobe River.

14. A. (OMPHALIA) FIBULA, *Bull.*, var. albus.
Bugle range, in meadows, Dec.

15. A. (PLEUROTUS) ILLUMINANS, *Müll.* Phosphoreus; pileo glabro fulvo; stipite crasso; lamellis latis crassis decurrentibus.
Australia (*Talbot*).
About 2 inches across.

The following remarks accompanied the specimens:—"This district is remarkably prolific in curiosities, and something new is constantly turning up around us. We have now before us a luminous mushroom, by which in a dark room last night we were able to read distinctly the headlines of several newspapers."

16. A. (PLEUROTUS) CANDESCENS, *Müll. MSS.* Pileo excentrico glabro ex albo sordide fulvescente, margine inflexo; stipite sursum dilatato glabro; lamellis tenuibus longe decurrentibus hic illic laceratis.
On dead wood in sandy soil. Melbourne, April 1871.
Pileus 1½–2 inches across; stem 1 inch high. Strongly phosphorescent.

Very near *A. lampas*, B., Swan river=*A. noctilucus*, B., Tasmania, but has thinner gills.

I cannot, from the dry specimens, distinguish *A. pyrogenus*, Müll., from Yarra Yarra, Victoria, "pileus white below, slightly brown above," or *A. luminans*, Müll., Melbourne. "Its luminosity is of a silvery shine and very apparent; it is partially restored to it when moistened again;" odor suavis.

17. A. (PLEUROTUS) APPLICATUS, *Batsch.*
Gainsford, Queensland (*E. Bowman*).

18. A. (PLEUROTUS) SCABRIUSCULUS, *B.* Albus, sessilis; pileo subdimidiato angusto v. flabelliformi, antice scabriusculo estriato, margine lobato; lamellis angustis e puncto tomentoso oriundis. Müll. no. 4.
Victoria. On decayed wood.

19. A. (PLEUROTUS) CARYOPHYLLEUS, *B.* Pallide fulvus; pileo pos-

tice attenuato, flabelliformi, multilobato, tenui, glabro, margine tenuissimo hyalino angustissime inflexo; lamellis angustis lævibus.
Victoria. No. 4.

20. A. (Pleurotus) Guilfoylei, *B.* Albidus; pileo reniformi, suborbiculari, postice tomentoso, margine involuto; stipite obsoleto; lamellis tenuibus acie acutissimis.
Tweed (*Guilfoyle*).
Pileus $1\frac{1}{2}$ inch broad, 1 inch long. Very much wrinkled when dry.

21. A. (Pholiota) pudicus, *Fr.*
Valleys and woods. Sealer's Cove, May.
Supra castaneo-fuscus, subtus cum stipite fulvus.

22. A. (Flammula) penetrans, *Fr.*, var. *australis*.
Lamellis cum stipite pileo aurantiaco-fulvo dilutioribus. *Müll.* no. 8.
On soil (probably covering pine-chips). Fifth creek, June.
There is also a large form without any spots on the gills.

23. A. (Naucoria) furfuraceus, *P.*
Wangaratta.
With it an undetermined *Hygrophorus*.

24. A. (Naucoria) Bowmanni, *B.* Pusillus; pileo convexo umbilicato innato floccoso-scabro; stipite gracili floccoso glabrescente; lamellis breviter adnatis distantibus ventricosis.
Herbert's Creek (*E. M. Bowman*). On the ground.
Pileus 2–4 lines across; stem $\frac{1}{2}$ inch high, $\frac{1}{2}$ line thick. Spores ·00028 long.
Belongs to the same section as *A. erinaceus*.

25. A. (Naucoria) frusticola, *B.* Dense cæspitosus; pileo convexo umbilicato fulvo; stipite gracili deorsum incrassato furfuraceo pallidiore; lamellis olivaceo-ferrugineis emarginatis decurrentibus.
Lofty range. On roots of grass, &c.
Pileus $\frac{1}{4}$–$\frac{1}{2}$ inch across; stem 1 inch high, $\frac{1}{2}$–$\frac{3}{4}$ line thick. Spores ·00028 inch long.
Allied to *A. inquilinus*. Gills distinctly decurrent.

26. A. (Galera) tener, *Schæff.*
Wangaratta. Pileo convexo. Spores ·0006 long.

27. A. (Galera) hypnorum, *Batsch.*
Torrens River.
Spores bright tawny, ·00054 long by ·0003, with a distinct hilum.

28. A. (Crepidotus) globigera, *B.* Pileo flabelliformi v. reniformi basi attenuato, molli, glabro; lamellis tenuibus ochraceis, sporis globosis.
Wangaratta. About an inch long and wide. Spores ·00025 in diameter; different from any thing I have seen in the subgenus.

29. A. (Psalliota) campestris, *L.*
Wangaratta.
A small form.

30. A. (Stropharia) semiglobatus, *Batsch.*
Wangaratta; Australia Felix.
Spores ·0008 long.

31. A. (Hypholoma) dispersus, *Fr.*
Lofty range. N.-W. Australia, Aug.

32. A. (Hypholoma) fascicularis, *Huds.*
Macclesfield, Sept.

33. A. (Psathyra) sonderianus, *B.* Pileo acute convexo supra dilute et squalide flavido, margine integerrimo; stipite albo subsericeo; lamellis dilutis.
Fifth creek, June.
Pileus 1 inch across, stem 2½ inches high, 2 lines thick; mycelium white, filamentous.

34. A. (Panæolus) papilionaceus, *Bull.*
Wangaratta. On dung.
Spores ·0006–·00057 long.

35. A. (Panæolus) phalænarum, *Bull.*
Adelaide (*Schomburgk*). With no. 8.

36. A. (Psathyrella) trepidus, *Fr.*
Adelaide, amongst apple-trees.

37. A. (Psathyrella) disseminatus, *P.*
Oolingyarrah.

38. Coprinus stercoreus, *Fr.*
Sixth creek, June.

39. C. ephemerus, *Fr. Bull.* t. 128.
Gainsford, Queensland (*E. M. Bowman*).

There is also another species from Wangaratta, which unfortunately is indeterminable.

40. Bolbitius titubans, *Fr.*
Wangaratta.

Two specimens only. The spores are of the same size as in British specimens.

41. Paxillus Muelleri, *B.* Pileo convexo umbonato obscure furvo; stipite fulvo pruinato; lamellis decurrentibus una desinentibus fulvis. *Müll.* no. 121.

In meadows near the river Albert, May; Wilson's Promontory.
Pileus 1½ inch across; stem 1 inch high, nearly ½ inch thick.

42. **Hygrophorus flammans**, *B.* Pusillus; pileo infundibuliformi saturate rubro; stipite sursum dilatato; lamellis paucis decurrentibus livide rubris.
On moist rocks on the highest parts of Mount Aberdeen, March.
Pileus ½ inch across; stem ½ inch high.

43. **H. ceraceus**, *Fr.*
Hodden range, May.

44. **H. nigricans**, *B.* E rubro-aurantiaco nigricans, pusillus; pileo umbilicato; stipite capillari; lamellis distantibus decurrentibus.
Pileus 2 lines across; stem ¾–1 inch high.

With the *Hygrophorus* was a single specimen of some Agaric, probably *A. fibula*.

45. **Russula rubra**, *Fr.*
Grassy places near the river Albert, May.

46. **R. fragilis**, *Fr.*; *Schomb.* no. 10.
Adelaide; Herbert's creek (*E. H. Bowman*).

47. **Marasmius hæmatocephalus**, *Mont*, forma minima, no. 115.
On dead leaves. Dandenong range.

48. **M. ferruginus**, *B. Hook. Lond. Journ.* 1843, forma minima.
On dead leaves in valleys near the river Tarwin, April.

The specimens of both these species are extremely poor.

49. **Lentinus fulvus**, *B. Ann. Nat. Hist.* vol. x.; *Müll.* no. 5.
Australia Felix.

50. **L. fasciatus**, *B. Hook. Journ. Bot.* ii. p. 146.
Paramatta (*W. Woolls*); Rockhampton (*E. Bowman*); New England.

51. **L. Lecomtei**, *Fr.*
New England, Tweed River (*Guilfoyle*).

52. **L. subnudus**, *B. Hook. Lond. Journ.* 1847; *Schomb.* no. 24.
Adelaide.

53. **L. exilis**, *Kl.*
Adelaide.

54. **L. vulpinus**, *Fr.*
Tweed River (*Guilfoyle*).

If not the real plant, it is at least very near it.

55. **Panus coriaceus**, *B.* Gregarius; pileo coriaceo demum sulcato brunneo postice vel juniore nigro subtiliter squamuloso areolato; stipite nullo; lamellis crassis hepaticis.

On bark, Gipps Land.

About an inch across when fully grown.

A very beautiful species which approaches *Xerotus*.

56. XEROTUS ARCHERI, *B.* *Fl. Tasm.* ii. p. 250.

Sealer's Cove, no. 141. Dandenong range, no. 130.

57. SCHIZOPHYLLUM COMMUNE, *Fr.* nos. 15, 110, 144; *Schomb.* nos. 21, 23, 29.

Rockingham Bay; Sealer's Cove; Tweed River (*Guilfoyle*); Gipps Land; river Yarra; Wilson's Promontory; Victoria River (*Lentinus pulchellus*, Müll.) &c.

58. LENZITES STRIATA, *Fr.*, var. MINOR.

Herbert's Creek, near Rockhampton.

A very small form, not exceeding half an inch in width.

59. L. ABIETINA, *Fr.*; *Schomb.* nos. 12, 65.

Adelaide.

60. L. BECKLERI, *B.* Ligneus, horizontalis, subreniformis, disco orbiculari affixus; pileo albido crassiusculo irregulari noduloso subtiliter tomentoso, margine ochraceo; lamellis crassis dichotomis obtusis ochroleucis postice sublabyrinthiformibus. No. 10.

61. BOLETUS ANANÆCEPS, *B.* Pileo convexo, in verrucas planas crassas amplas rupto floccoso-squamoso.

Wangaratta.

Spores ·00117 long.

62. B. NAPIPES, *Müll.* Pileo pulvinato rubro-fusco demum nigrescente; stipite obconico; poris liberis citrinis.

Meadows near river Albert, May.

63. POLYPORUS ARCULARIUS, *Fr.*; *Schomb.* no. 64.

Rockhampton (*M. E. Bowman*).

64. P. OBLECTANS, *B.* *Hook. Lond. Journ.* 1845.

King George's Sound; Herbert's Creek (*E. M. Bowman*); Gainsford; Queensland.

65. P. XANTHOPUS, *Fr.* no. 14; *Schomb.* no. 61.

Cape York (*E. Daemel*); Tweed River (*Guilfoyle*).

66. P. LUCIDUS, *Fr.*

Rockhampton (*E. M. Bowman*).

67. P. (PLEUROPUS) SUPERPOSITUS, *B.* Pileis conchiformibus imbricatis e stipite communi cylindrico oriundis pallidis pruinosis anguste zonato-sulcatis, poris minimis brevibus, contextu ochraceo.

New England, I believe.

Common stem 5 inches high, $\frac{1}{2}$ an inch thick in the centre; pilei reniform, about 8 springing from the same stem, the upper one being nearly orbicular, $1\frac{1}{2}$ inch wide, 1 inch long, and distinctly pleuropodous.

In one specimen, apparently from an attempt to form an hymenium on the pilei, or possibly from the presence of some resupinate parasite (for the pores are much larger where they are more developed on one side of the stem), the surface is scabrous.

68. P. SANGUINEUS, *Fr.*; *Schomb.* no. 228.

Cape York (*E. Daemel*); Wangaratta; Timbarra; New England (*C. Stuart*); Ararat (*C. Green*); Paramatta; Tweed River (*Guilfoyle*); Port Darwin (*Schomburgk*).

A perfectly resupinate form occurred in Mount Kaiserstuhl, Sep.

69. P. LUTEUS, *Nees.*

Clarence River.

70. P. AFFINIS, *Nees.*

Tweed River (*Guilfoyle*).

71. P. FLABELLIFORMIS, *Kl.*

Tweed River (*Guilfoyle*).

72. P. DILATATUS, *B.* *Hook. Lond. Journ.* 1847.

Tweed River (*Guilfoyle*).

73. P. (ANODERMEI) CITREUS, *B.* Pileo anguste spathulato v. fisso-flabellato citreo subzonato lineato, margine inflexo tenui subacuto, citreo-tomentoso; poris subcarneis sinuato-angulatis parvis, dissepimentis tenuibus. No. 3.

On dead wood.

Pileus $\frac{3}{4}$ inch long, $\frac{1}{4}$ across. Mycelium yellow, penetrating the wood.

Like many other Anodermei, the older parts of the pileus become smooth. The pores are very like those of *P. vaporarius.*

74. P. (ANODERMEI) BECKLERI, *B.* Tenuis, dimidiatus, albus, postice effusus; pileo minutissimo piloso-scabro, margine tenui subinflexo; poris minimis angulatis. No. 16.

On dead wood.

Pores $\frac{1}{200}$ inch.

75. P. (ANODERMEI) CORRIVALIS, *R.* Imbricatus; pileo conchiformi albido lineato tomentoso; hymenio concavo, poris angulatis minimis. *Schomb.* no. 47.

Adelaide.

Pores $\frac{1}{160}$ inch. Pileus $\frac{1}{2}$ inch wide, $\frac{1}{4}$ long.

Allied to *P. chioneus.* Schomb. no. 34 is a resupinate form.

76. P. (ANODERMEI) ASCOBOLOIDES, *B.* Pileis resupinatis orbicularibus crassiusculis congestis e strato crasso coriaceo oriundis, vix reflexis, tomentosis, albidis; hymenio nigro, poris regularibus hexagonis parvis.

Australia.

Pilei about $1\frac{1}{2}$-2 lines across.

Looks at first sight like an *Ascobolus*.

77. P. (Placodermei) portentosus, *B.* *Hook. Lond. Journ.* 1844.

Southern Australia.

Allied to *P. betulinus*.

78. P. (Placodermei) australis, *F.*

Australia Felix; Yarra Yarra.

79. P. (Placodermei) igniarius, *Fr.*; *Schomb.* no. 31.

Port Albert, Adelaide.

The surface of the Australian form is always more or less cracked.

80. P. (Placodermei) carneus, *Nees*; *Schomb.* with nos. 25 & 23.

Adelaide.

81. P. (Placodermei) endapalus, *B.* Pileis imbricatis coriaceis spadiceis longitudinaliter lineato-rugosis subtiliter tomentosis margine sterili pallidiore; hymenio concolori, poris minutis angulatis postice elongatis; contextu molli.

Tweed River (*Guilfoyle*).

Pileus 1–3 inches across, $\frac{1}{2}$ inch long, pores $\frac{1}{120}$. Substance as soft as amadou.

82. P. (Placodermei) Persoonii, *Mont.*

Tweed River (*Guilfoyle*).

This appears to be the same species with *Dædalea sanguinea*, Klotzsch.

83. P. (Inodermei) cinnabarrinus, *Fr.*

Lofty range, Moreton Bay.

84. P. (Inodermei) scruposus, *Fr.*; *Müll.* no. 128; *Schomb.* nos. 1,25.

Port Albert, Adelaide.

Pileus 5 inches across, 8 inches long, deeply grooved; hymenium deep rich brown.

No. 1 is *P. holosclerus*, B., which appears to be confluent with *P. scruposus*.

85. P. (Inodermei) libum, *B.* Pileo coriaceo glaberrimo polito postice disco affixo lobato profunde umbilicato subzonato candido, zona altera profunde radiata margine lutescente; poris ochraceis angulatis mediis, dissepimentis rigidiusculis acutis.

Tweed River (*Guilfoyle*).

Pileus 3 inches wide, $2\frac{1}{2}$ long; pores $\frac{1}{55}$.

86. P. (Inodermei) cichoraceus, *B.* *Hook. Lond. Journ.* 1842 *Müll.* no. 143.

Sealer's Cove.

87. P. (INODERMEI) HIRSUTUS, *Fr.*; *Müll.* nos. 1, 111.
Clarence River (*Dr. Beckler*); Gipps Land; Tweed River (*Guilfoyle*).

88. P. (INODERMEI) VERSICOLOR, *Fr.*
New England (*C. Stuart*).

A delicate pallid form. Care must be taken not to confound *P. flabelliformis* with this species.

89. P. (INODERMEI) LILACINO-GILVUS, *P.*; *Ann. Nat. Hist.* iii. p. 324.
Gipps Land.

90. P. (INODERMEI) ELONGATUS, *B.* *Hook. Lond. Journ.* 1842.
Timbarra, New England (*C. Stuart*).

91. P. (RESUPINATI) FERRUGINOSUS, *Fr.*
Broadribb River.

92. P. (RESUPINATI) CORTICOLA, *Fr.*; *Schomb.* no. 36.
Adelaide (*Dr. Schomburgk*).

93. TRAMETES FIBROSA, *Fr.*; *Schomb.* nos. 7, 33, 46.
Adelaide (*Dr. Schomburgk*).

94. T. PYRRHOCREAS, *B.* Pileo crassiusculo zonato postice demum velutino, antice breviter strigoso lineatoque; contextu compacto sed molli, fulvo; poris rotundis, dissepimentis crassis.
Herbert's Creek.

Pileus $2\frac{1}{2}$–3 inches wide, 2 inches long; umber-brown, as is also the hymenium; pores $\frac{1}{60}$. Twice as wide as in *Polyporus caperatus*, which it somewhat resembles; substance like amadou.

95. T. VERSATILIS, *B.* *Hook. Lond. Journ.* 1842, forma RESUPINATA.
Herbert's Creek.

96. T. MUELLERI, *B.* *Linn. Soc. Journ.* vol. x. p. 320; *Schomb.* no. 26.
Victoria River; Horcursaho, in Cuba.

97. T. ACUPUNCTATUS, *A.* Pileo tenui disco orbiculari affixo subzonato postice lineato-rugoso, contextu hymenioque margine sterili umbrinis, poris rotundis punctiformibus.
Herbert's Creek (*E. M. Bowman*).

Pores $\frac{1}{72}$ inch in diameter.

Closely allied to the last.

98. T. PHELLINUS, *B.* Pileo suberoso apodo vel disco orbiculari adnato dealbato rugoso ezonato; margine obtuso; hymenio pallido, poris mediis rotundis, dissepimentis obtusis.
On dead wood. New England.

Pileus 8 inches wide, 2 inches long; pores $\frac{1}{36}$.

Closely allied to *T. Sprucei*, B.; but the pores are twice as wide.

99. T. DEVEXA, *B.* Lignosa, subungulata, postice decurrens; pileo velutino subzonato subfulvo; hymenio pallido, poris mediis acie obtusis.

Tweed River (*Guilfoyle*).

Pileus 1½ inch wide, 1 long; pores $\frac{1}{36}$ across. Sometimes ungulate, without any trace of pores.

100. T. UNGULATA, *B.* Pileo duro albido breviter ungulato postice decurrente subtiliter tomentoso, margine obtuso rugoso; hymenio excavato, poris parvis acie subconcoloribus. *Schomb.* no. 2.

Adelaide.

Pileus 1½ inch wide, 1 inch long; pores $\frac{1}{80}$.

I have a species from Major Hobson, Staff Corps, Bombay, which much resembles this; "pileo molliusculo undulato subtiliter tomentoso, poris amplis armeniacis elongatis dissepimentis tenuioribus acie acutis." Pileus about the same; pores $\frac{1}{24}$ inch across.

101. T. EPITEPHRA, *B.* Minor; pileo ungulato postice decurrente zonato fusco hispidulo, margine albido; poris pallidis mediis acie obtusis. *Schomb.* no. 26.

Adelaide (*Schomburgk*).

Pileus ½ inch wide, ¼ long; pores $\frac{1}{36}$ across.

A pretty little species, with an irregular pileus marked with two or three furrows.

102. T. LACTINEUS, *B.*; *Ann. Nat. Hist.* vol. x. p. 371.

Var. postice fuscus, *Schomb.* nos. 7, 10, 42, 66.

Adelaide (*Schomburgk*); New England. Occurs also in Ceylon, Cuba &c.

103. T. COLLICULOSA, *B. Hook. Lond. Journ.* 1847.

New England. A single specimen.

104. T. OCCIDENTALIS, *Fr.*; *Schomb.* nos. 8, 17, 18, 40.

Adelaide (*Schomburgk*).

The pores in no. 8 approach closely to those of a *Dædalea*.

105. T. RIGIDA, *B. & Mont. Syll.* p. 168.

Tweed River (*Guilfoyle*).

106. DÆDALEA TENUIS, *B. Hook. Lond. Journ.* 1842; *Schomb.* nos. 9, 70.

Cape York, Adelaide.

At first apricot-coloured and velvety, gradually becoming smooth; more or less zoned and rugged, occasionally quite even.

107. D. HOBSONI, *B.* Pileo coriaceo dimidiato pallide cinereo sub-

tiliter tomentoso lineatoque repetite zonato, margine acuto; lamellis ligneis ochraceis postice poriformibus. *Schomb.* no. 3.

Adelaide (*Dr. Schomburgk*).

Pileus 4–5 inches wide, $2\frac{1}{4}$–$2\frac{1}{2}$ long.

The original specimens are from Bombay. The Australian have an ochroleucous pileus, and the gills toothed.

108. D. AULACOPHYLLUS, *B.* Pileo reniformi quandoque pedunculo brevi instructo albido tomentoso scabriusculo leviter zonato, margine acuto; lamellis umbrinis postice elongatis transversim sulcatis. *Schomb.* no. 58.

Adelaide.

Sometimes 8–9 inches wide, 3–4 inches long.

109. D. BOWMANI, *B.* Pileo e resupinato anguste reflexo tomentoso pallido; hymenio concolori poroso, poris sinuosis acie obtusis tomentosis; margine irregulari dentato-lobato.

Herbert's Creek (*E. M. Bowman*).

Forming narrow irregular patches 2 or 3 inches wide; pores $\frac{1}{12}$ inch across.

110. HEXAGONA TENUIS, *Fr.*; *Schomb.* no. 11.

Var. poris $\frac{1}{14}$ unc.

Cape York (*E. Daemel*); Adelaide (*Dr. Schomburgk*); N.E. Austr. (*Walter*).

111. H. SIMILIS, *B.* *Hook. Lond. Journ.* 1846.

Arnheim's Land; Australia (*Bynoe, Voyage of Beagle*).

112. H. POLYGRAMMA, *Mont. Cuba,* p. 379; *Schomb.* nos. 15, 19.

Adelaide (*Dr. Schomburgk*).

113. H. DECIPIENS, *B.* Pileo dimidiato zonato umbrino velutino-hispido sulcato; poris majoribus.

Adelaide (*Dr. Schomburgk*).

Pileus $1\frac{1}{4}$ inch wide, often orbicular and resupinate; pores $\frac{1}{20}$ inch across.

A very distinct species.

114. H. MÜLLERI, *B.* Tenuis, rigida, postice disco orbiculari affixa; pileo multizonato radiato rugoso lobato ochraceo-fuscescente, margine acuto; hymenio fusciduIo, poris mediis.

New England.

Pileus 4 inches across, 3 inches long; hymenium uneven, longitudinally depressed, pores $\frac{1}{60}$ inch across.

115. FAVOLUS SQUAMIGER, *B.* Pileo umbilicato squamis adnatis ornato, margine ciliato, stipite brevi areolato-squamoso; poris amplis elongatis decurrentibus.

New England.

Pileus 1½–2 inches across; stem ¾ high, nearly 2 lines thick, dilated upwards; pores 1 line across, 2 lines long.

Resembling *Polyporus agariceus*, but differs in the squamose pileus, and the stem not being velvety below.

116. F. CÆSPITOSUS, *B.* Densissime cæspitosus; pileis conicis umbilicatis, stipitibus glabris basi coalitis; poris mediis subdecurrentibus.

Clarence River (*Dr. Beckler*).

Densely tufted; stems connected at the base with a white xylostromoid substance, fifty or more in a tuft, 2 inches or more high, smooth, even, compressed, striated; pilei conical, obtuse, umbilicate, pallid, deeply reticulated when dry; pores angular towards the margin, elongated behind, $\frac{1}{30}$ inch across, adnate or subdecurrent.

117. F. HISPIDULUS, *B. & C. Linn. Soc. Journ.* x. p. 321; *Schomb.* no. 37.

Adelaide.

The single specimen is not in good condition; but it appears to be the same as the species from Cuba.

118. MERULIUS PALLENS, *Schw.*; *Müll.* no. 21.

On dead wood, Tarwin.

119. HYDNUM (APUS) MÜLLERI, *B.* E resupinato reflexum, velutinum, subzonatum, aculeis longis gracilibus ochraceis.

Tweed River (*Guilfoyle*).

Sometimes connate. Approaching *Irpex*, but a true *Hydnum.*

120. IRPEX FLAVUS, *Kl.*; *Schomb.* nos. 4, 35.

Herbert's Creek, Queensland (*E. M. Bowman*); Rockingham Bay (*Dallachy*); Adelaide (*Dr. Schomburgk*).

121. PHLEBIA REFLEXA, *B. Hook. Lond. Journ.* 1845; *Müll.* no. 1.

Bunip Creek, Victoria.

122. P. HISPIDULA, *B.* E resupinato reflexa, rubiginosa, zonata, velutino-hispidula; hymenio brunneo-nigro radiato-rugoso, *Schomb.* no. 13.

Adelaide (*Dr. Schomburgk*).

With the exception of the absence of the radiating wrinkles, resembling *P. zonata*, B. & C., from South Carolina.

123. KNEIFFIA MÜLLERI, *B.* Tota resupinata, tenuis, junior farinulenta, senior continua hic illic rimosa granulis peritheciiformibus apice niveis.

Adelaide (*Dr. Schomburgk*).

When the granules have fallen off, it looks like a *Porothelium.*

124. THELEPHORA DENDRITICA, *Fr.*

Gipps Land; Clarence River.

125. T. DECOLORANS, *B.* *Linn. Soc. Journ.* vol. x. p. 328.
Locality not legible. Found also in Cuba.

126. T. CONGESTA, *B.* Pusilla, gregaria, atropurpurea, parce furcato-ramosa, deorsum pubescens, ramulis subcylindricis acutis fastigiatis quandoque compressis.
Moist places, as Yarra Yarra, Jan. Gainsford, Queensland, in fine sand; Rockhampton (*E. M. Bowman*).

127. T. LUTEO-CINCTA, *B.* Terrestris, effusa; hymenio inæquabili fusco, ambitu byssino luteo.
On the ground. Wangaratta.
About 1½ inch across; spores ferruginous, ·0005 inch long.
Closely allied to *P. puteana.*

128. T. EXSCULPTA, *B.* Orbicularis, carneo-grisea, tota resupinata, centro lævi, versus marginem exsculpatum dentato-radiata, subvenosa, pulverulenta, hic illic lacunosa, subtus atropurpurea.
On bark. Dandenong range.
About 2½ inches across, of a peculiar grey tint, slightly tinged with pink. Edge minutely toothed and radiated.

129. STEREUM ELEGANS, *Fr.*; *Müll.* no. 44.
Gipps Land; Wangaratta; Moe Swamp; Queensland (*E. M. Bowman*).

130. S. LOBATUM, *Fr.*; *Müll.* nos. 12, 140 (113, forma minor).
Sealer's Cove; Cape York (*E. Daemel*); Gipps Land; New England (*C. Stuart*); Tweed River (*Guilfoyle*); Dandenong.

131. S. SPADICEUM, *Fr.*
Western Point. June.

132. S. ILLUDENS, *B.* *Hook. Lond. Journ.* 1845; *Müll.* no. 139.
Sealer's Cove; Port Darwin (*Schomburgk*); Wangaratta; Fifth Creek, June.

133. S. HIRSUTUM, *Fr.*; *Müll.* no. 142, forma minor, no. 109, forma resupinata.
Porungorup, W. Australia; Sealer's Cove; New England (*C. Stuart*); Western Point, no. 109.
Var. rameale, *Schwein.*
Fifth Creek. June.

134. S. SCHOMBURGKII, *B.* E resupinato reflexum, suborbiculare, demum conchiforme, umbrinum, antice subzonatum, velutinum; hymenio lævi concolori. *Schomb.* no. 5.
Port Darwin.
From ½–1 inch across. Colours very much like those of *Lenzites striata.*

135. S. PAPYRACEUM, *Mont. Cub.* p. 374, forma resupinata.
Wangaratta.

136. S. sparsum, *B.* Candidum v. pallide ochraceum, in pustulas duras quandoque confluentes dispositum.

Australia.

Consisting of detached, roundish, hard bodies, which sometimes become confluent and form lines after the fashion of *Corticium seriatum.* It looks, at first sight, like an *Hypocrea,* from being studded with black specks, the commencement of some Hyphomycetous fungus. It occurs also in Ceylon.

137. Corticium cæruleum, *Fr.*

Clarence River, Tweed River (*Guilfoyle*).

138. C. tephrum, *B & C.* *Linn. Soc. Journ.* vol. x. p. 336; *Schomb.* no. 48.

Adelaide (*Dr. Schomburgk*).

139. C. Auberianum, *Mont. Cub.* p. 372; *Müll.* no. 13.

Victoria. On *Stereum.*

140. C. arachnoideum, *B.* *Ann. Nat. Hist.* 1844; *Schomb.* no. 53.

Adelaide (*Dr. Schomburgk*).

141. Dyctyonema æruginosum, *Nees.*

Rockingham Bay (*I. Dallachy*).

142. Clavaria botrytis, *P.*

Paramatta (*W. Woolls*); New England (*C. Stuart*).

143. C. flava, *Fr.*

On gravelly tops of mountains, at Yanaki, of Wilson's Promontory, May; Gipps Land, near Port Albert.

144. C. abietina, *Schum.*; *Müll.* no. 9.

Victoria.

145. C. crispula, *Fr.*

Northampton.

146. C. lorithamnus, *B.* Pallide umbrina; ramis strictis apicibus breviter bifidis acutiusculis.

On soil, Dandenong.

About 1½ inch high, with the habit of *C. stricta,* but without any white filiform mycelium; spores apparently white.

147. C. rugosa, *Bull.*

Cypress Gully, near Cape Everard.

A slender form, forked and cylindrical.

148. C. inæqulais, *Müll.* no. 126.

Amongst sand, Cypress Gully, Wilson's Promontory.

Scarlet and orange.

149. C. ARGILLACEA, *Fr. Besk.*
Gipps Land.

150. C. PALUDICOLA, *Libert.*
Lofty range, amongst *Osmunda.*

151. CALOCERA GUEPINIOIDES, *A.* *Hook. Lond. Journ.* 1845.
Fifth Creek, June.

152. TREMELLA LUTESCENS, *Fr.*
Wangaratta; Fifth Creek, var. *alba*; Jack River.

153. T. MESENTERICA, *Retz.*
On *Banksia australis*, East Gipps Land (*C. Walter*).

154. HIRNEOLA POLYTRICHA, *Fr. Fung.* p. 26; *Müll.* no. 136; nos. 6, 50.
Crocodile River; Broadribb, Adelaide (*Dr. Schomburgk*); Capricorn, Queensland (*Guilfoyle*).

155. H. HISPIDULA, *B.* *Ann. Nat. Hist.* vol. iii. p. 326 (sub *Exidia*); *Müll.* no. 7.
Victoria.

156. H. AURICULA JUDÆ, *F.*
New England (*C. Stuart*),

157. AURICULARIA ALBICANS, *A.* Orbicularis, extus albicans, subtiliter pubescens; hymenio nitido piceo-nigro.
Herbert's Creek.
When dry, the hymenium is peculiarly brilliant.

158. GUEPINIA SPATHULARIA, *Fr.*
Herbert's Creek (*E. M. Bowman*); King's Creek.

159. G. PEZIZÆFORMIS, *R.* *Hook. Lond. Journ.* vol. iv. p. 60.
Australia Felix.

160. LASCHIA TREMELLOSA, *Fr.*
Bunip; Tweed River (*Guilfoyle*).

161. L. MICROPUS, *B.* Luteo-fusca, minuta, pezizæformis, breviter stipitata, demum reflexa; pileo venoso-rugoso; hymenio lævi.
Australia Felix.
Not exceeding 2 or 3 lines across.

162. GEASTER DRUMMONDII, *B.* *Hook. Lond. Journ.* 1845.
Geelong (*S. Hannaford*); Swan River.

163. G. FIMBRIATUS, *Fr.* (G. novo-hollandicus, *Müll.*)
On moist grassy spots, Brown-Hill Creek; Fifth Creek.

164. G. MINIMUS, *Schw.*
On moist clayey soil, near Fifth Creek, June; Rockhampton (*E. M. Bowman*).

165. G. SACCATUS, *Fr.*; *Müll.* no. 145.
Clarence River (*Dr. Beckler*).

166. BOVISTA MÜLLERI, *B.* Rufescens, subglobosa, peridio exteriore in particulas minutas rupto, interiore lævi (sicco ruguloso), ore minuto subdentato; sporis eximie processibus hyalinis rugoso; capillitio pallide lilacino.
Herbert's Creek, Queensland (*E. M. Bowman*).

Resembles *B. cervina*; but the spores, not to mention other points, are totally different.

167. B. LILACINA, *Mont. & B.* *Hook. Lond. Journ.* 1845.
Victoria (*F. Mueller*).

168. LYCOPERDON CÆLATUM, *Fr.*
Amongst grass, Bangitata, March.

169. L. AUSTRALE, *B. Fl. Tasm.* ii. p. 266.
In sandy turfy meadows, near the mouth of the river Albert; Fifth Creek, June.

A more distinctly pulverulento-squamous form.

170. L. GLABRESCENS, *B. Fl. Tasm.* ii. p. 265.
Wilson's Promontory.
Spores with long pedicels; mouth irregularly toothed.

171. PODAXON PISTILLARIS, *Fr.*
Sutton River, Port Phillip.

172. XYLOPODIUM AUSTRALE, *B.* Stipite diffracto-squamoso radicante; sporis majoribus echinulatis flavis.
Murray Desert (*Dr. Beckler*), October.
Head 2 inches across, stem 3½ inches high, 1 thick above; spores ·00021 in diameter. It seems to have a volva when young.

173. POLYSACCUM MARMORATUM, *B.* Stipite subæquali rugoso peridioque maculis piceo-fuscis marmorato; sporis fuscis.
Barrier range.

A single specimen only. I have the same thing from the Swan River.

174. SCLERODERMA PANDANACEUM, *Müll.* Globosum, sessile, luteum, basi lævi, sursum tessellatum, floccis sordide luteis.
Rockingham Bay (*J. Dallachy*).
About 1½ inch across, quite stemless, strongly tessellated; spores ·0004 inch in diameter.

175. S. GEASTER, *Fr.*
Wangaratta; Herbert's Creek.

176. S. BOVISTA, *Fr.*
Wangaratta.

177. S. VULGARE, *Fr.*
Wangaratta.

178. ASEROË RUBRA, *Lab.*
Amongst rubbish left by river-floods. Very fugacious.
Dandenong (*Boyle*); New England (*C. Stuart*); Clifton, New England, Lake Gilles (*J. Stuart*).

In all these specimens the rays are bifid only at the very extremity; spores ·0003 inch long. Dyes the fingers when fresh; but the colour is very fugacious.

179. A. PENTACTINA, *Endl. in Schlecht. Diss.* p. 7.
New England, Timbarra (*C. M.*).

Hymenium distinctly rugose, as stated by Corda; but this is also the case in the Dandenong specimens, which I at first thought might be distinct. Robert Brown was inclined to an opinion that all the Australian specimens were referrible to a single species.

180. DICTYOPHORA MERULINA, *B. Intell. Obs.* ix. p. 404.
Rockingham Bay, February.
Head rivulose, network even.

181. CLATHRUS CRISPUS, *Turp.*; *Berk. Ann. Nat. Hist.* ix. p. 446.
Amongst grass, Rockingham Bay.

182. C. PUSILLUS, *B.* *Hook. Lond. Journ.* 1845.
Wide Bay (*Dr. E. F. Parker*).

183. ILEODICTYON GRACILE, *B.*; *Hook. Lond. Journ.* 1845.
Wangaratta; Yarra Yarra; Port Philip.

184. CYATHUS LESUEURII, *Tul. Ann. d. Sci. Nat.* 1844.
On dung, Paramatta (*W. Woolls*).

185. C. INTERMEDIUS, *Tul. l. c.*
Gainsford, Queensland; Herbert's Creek (*Ed. Bowman*).

186. STEMONITIS FASCICULATA, *P.*
Australia (*Miss Atkinson*).

187. PHYSARUM NUTANS, *P.*, var. peridio niveo, stipite sulcato rubro.
Crocodile Creek.
Flocci white; spores ·00047 in diameter.

188. ARCYRIA OCHROLEUCA, *Fr.*; *Müll.* no. 2.
On very decayed wood.

189. PUCCINIA MALVACEARUM, *Mont. Fl. Ch.* viii. p. 43; *Cord. Ic.* vi. fig. 12.

On *Malva rotundifolia*, Melbourne.

It also occurs abundantly on the common Hollyhock. Introduced possibly from Chili, where it was originally found by Bertero.

190. P. DICHONDRÆ, *B.* Soris minutis hypophyllis rarius epiphyllis sparsis æcidiiformibus; sporis curtis breviter pedunculatis, ultimo articulo obtuse apiculato.

Spores about ·005 inch long.

191. P. AUCTA, *B. & Müll.* Soris hypophyllis nervo medio utrinque consitis bullatis, epidermide sera fracta; sporis pedicellatis elongatis pallidis demum biseptatis. *Müll.* no. 12.

Port Lincoln. On *Lobelia anceps* (*C. Wilhelmi*).

The sori look like little *Pezizæ*.

192. CYSTOPUS CANDIDUS, *Lév.*; *Müll.* no. 49.

On *Capsella bursa-pastoris, Cardamine stylosa,* and *Lepidium cuneifolium.* Plenty range, October; Wilson's Promontory, May; Axe River, November.

193. LECYTHEA LINI, *Lév.*

Murray River. On *Linum marginale,* both on the stem and leaves.

194. UROMYCES PUCCINOIDES, *B. & Müll.* Soris bullatis; pseudoperidiis scariosis; sporis fuscis apiculatis quandoque apice obliquis dentatisve.

Holdfast Bay. On leaves and flower-stalks of *Goodenia herpystica,* in inundated muddy spots.

Spores very variable in length, about as long as the peduncle.

195. ÆCIDIUM RANUNCULACEARUM, *DC.*; *Müll.* no. 47.

Gun Creek, Nov., on *Ranunculus rivularis*; Victoria, on *Ranunculus inundatus.*

196. Æ. GOODENIACEARUM, *B.* Soris aggregatis oppositis; pseudoperidiis sparsis nec circinatis margine brevi; sporis aurantiacis.

On leaves of *Selliera.*

On some leaves are little raised pustules, which contain a quantity of irregular crystals. Other specimens did not agree with the above characters, having circinate pseudoperidia disposed in orbicular spots, which are brown beneath, and the margin distinctly lacerated. I have not sufficient specimens to say whether these are distinct.

197. Æ. MICROSTOMUM, *B.* Soris paucis parallelis hemisphæricis;

pseudoperidiis epidermide arcte inclusis ore parvo, demum apertis. *Müll.* no. 48.

On *Lobelia pedunculata.*

Sori disposed in a single row on either side of the midrib; plant drawn up and altered, much after the fashion of the Anemone-*Æcidium.*

The disposition of the pseudoperidia is just that of *Puccinia aucta.*

198. *Æ.* COMPOSITARUM, *DC.*; *Müll.* nos. 148, 124.

Sealer's Cove, on leaves of *Senecio Velleyioides.*

199. RŒSTELIA POLITA, *B.* Pseudoperidiis ochraceis cylindricis politis, ore anguste candido denticulato.

Bambamero Lake, Nov.

On the tender branches of *Muhlenbeckia Cunninghamii.*

Looking at first like a *Solenia.* Cells of the pseudoperidia angular, transversely striate. Spores large. Pseudoperidia nearly a line long, at first obtuse.

200. CRONARTIUM ASCLEPIADEUM, *Fr. Obs.*

Darling Downs (*H. Law*), on *Jacksonia scoparia.*

The only specimens are in a young state.

201. USTILAGO UTRICULOSA, *Müll.*

On *Polygonum gracile,* &c. Gipps Land; River Tambo, Feb.

202. U. CARBO, *Tul.*

On *Danthonia.*

Spores ·0004.

Approaches var. *bromivora.*

Var. BROMIVORA, *Tul.*

Eastern subtropical Australia. Murray River, on *Bromus arenarius.*

Spores ·000028.

Var. COLUMELLIFERA, *Tul.*

Rockhampton.

The mass is formed within the integuments, which become brown, and at length burst; spores even, globose or subglobose, ·0003, mixed apparently with young starch-cells compacted around a central column, which seems to be a prolongation of the axis.

203. U. BULLATA, *B.* *Fl. Nov. Zel.* ii. p. 196.

River Murray.

Spores ·0003, very minutely granulated, slightly angular.

204. U. MARMORATA, *B.*; *Müll.* no. 94. Compacta, epidermide nondum fracta marmorata; sporis ovatis lævibus.

Mount Gambier, on *Isolepis prolifera.*

Spores ·0005 by ·00025.

205. **Isaria fuciformis**, *B.* Pallida, gracilis, filiformis, parce ramosa, ramulis acutis; sporis minutissimis globosis. *Müll.* nos. 95, 98.

Mount Gambier, on some germinating cereal.

Bursting through the cuticle. At first quite simple, then throwing out a few short branches, which at first are rather obtuse, but gradually become acute. It looks, when dry, like some minute Alga. About ½ an inch high when full-grown.

206. **Rhinotrichum pulchrum**, *B.* Strato tenui croceo, floccis globoso-clavatis; sporis citriformibus, immixtis aliis triseptatis.

On dead wood, Wangaratta.

Spores ·000$\dot{6}$.

207. **Aspergillus Mülleri**, *B.* Niveus; hyphasmate repente; floccis erectis subflexuosis; sporis inæqualibus ellipticis obovatisque minutissime asperulis.

Oolingyarrah, on *Lepiota bubalina.*

Spores ·0005–·0004.

The same species apparently occurs on *Agaricus luminans*, Müll.

208. **Verticillium eximium**, *B.* Floccis ramosis; ramulis brevibus apice incrassatis processibus radiantibus acutis basi tumidis sporiferis ornatis; sporis oblongis et pedicello brevissimo obliquo affixis.

On some *Clavaria*, apparently *C. botrytis.* Paramatta (*W. Woolls*).

Spores very variable in size, ·000$\dot{3}$–00025.

Certainly the finest species of the genus.

209. **Cladosporium herbarum**, *Lk.*

On oak-leaves, Botanic Garden, Melbourne (*Adamson*), Aug.

210. **Phycomyces nitens**, *Ag.*

Near Broadribb River.

211. **Geoglossum hirsutum**, *P.*

Port Phillip.

212. **G. glabrum**, *P.*

Port Phillip, Aug.

213. **Morchella esculenta**, δ. **conica**, *Mull.* 145.

Australia Felix (*Mr. Weidenbach*); Sealer's Cove.

Sporidia ·001$\dot{3}$.

214. **M. semilibera**, *DC.*; *Müll.* no. 145.

Clarence River. Australia Felix.

215. **Mylitta australis**, *B.*, minor.

From the garden of the Rev. Mr. Howard, Beechworth.

A much smaller plant than the original form, not exceeding 1½

inch in diameter, globose or flattened. I can see no distinctive character.

216. PEZIZA COCHLEATA, *Huds.*
Adelaide.

217. P. REPANDA, *Wahl.*
Wangaratta.

218. P. AURANTIA, *Oed.*; *Müll.* no. 120.
Deep valleys near Sealer's Cove, May.

219. P. HIRNEOLOIDES, *B.* *Journ. Linn. Soc.* x. p. 365, var. Gelatinosa, centro affixa, rubro-rufa, subtus pallida subtomentosa; ascis amplis; paraphysibus tenuibus; sporidiis oblongis. *Müll.* no. 6.
Victoria.
Sporidia ·0008.
In the Cuba specimens the sporidia are slightly curved.

220. P. (GEOPYXIS) ALUTICOLOR, *B.* Cupulis cyathiformibus extus rugosis, margine inflexo; stipite sulcato passim basi dilatato; hymenio lævi; sporidiis fusiformibus.
Clarence River.
Cups $\frac{1}{3}$ inch across; stem 1 line high; spores ·001–·00012.

221. P. (HUMARIA) MÜLLERI, *B.* Cupulis irregularibus marginatis, extus subtiliter tomentosis; hymenio coccineo, sporidiis 1–2-nucleatis, mycelio amplo. *Müll.* no. 9.
Plenty Creek. On the ground.
Threads of the mycelium abundant, binding the particles of sand, very variable in thickness. Sporidia ·0006–·001, variable in length and breadth.
Allied to *P. humosa.*

There is also another species, allied to *P. subhirsuta*, in gravelly places in mountain-woods in May, with sporidia ·0006; cup delicately downy. The specimens are scarcely good enough to determine.

222. P. RUTILANS, *Fr.*; *Mull.* no. 9.
In moist places near mountain-cataracts. Lofty range.
Sporidia echinulate, ·0012; paraphyses clavate.

223. P. ÆRUGINOSA, *Bull.*
On wood in deepest shade of Buffalo Mountains.

224. P. (PATELLIA) ADAMSONI, *B.* Orbicularis, plana, marginata, nigerrima; sporis breviter et anguste fusiformibus nec articulatis.
On Gum-tree railing, Melbourn.
Resembling *P. lignyota*, but the spores are different.

225. **Bulgaria sarcoides**, *Rabh.* *Müll.* no. 122.
Sealer's Cove; deep valleys of Wilson's Promontory.

226. **Cordyceps Gunnii**, *B. Fl. Tasm.* ii. p. 278.
Australia Felix; Port Phillip, June (*C. French*).
Shrinks very much in drying.

227. **C. entomorhiza**, *Fr.*
Mouth of river Yarra.

228. **Hypocrea cerebriformis**, *B.* Pulvinata, rugoso-lobata cervina, contextu crasso pallido; peritheciis concoloribus; sporidiis globosis octonis.
Adelaide (*Dr. Schomburgk*).
The lobes frequently stretch out so far that on a section the whole surface is surrounded by perithecia. Mass ½–1 inch across.

229. **Xylaria hypoxylon**, *Ehr.*
Herbert's Creek (*E. M. Bowman*).
A simple form, acute, pilose below.

230. **X. polymorpha**, *Fr.*
Tweed River, N. S. Wales (*Guilfoyle*).

231. **X. ectogramma**, *B.* Clavula oblongo-lineari obtusa laccata dealbata hic illic rimosa; ostiolis determinato-seriatis; stipite fusco brevi vel elongato.
Victoria.

Differs from *X. acicularis* in having the ostiola seriate, and from *X. grammica* in their not being sunk in the cracks. Mostly simple, sometimes forked, white within, covered with a delicate crust, greyish externally, about 2 inches high; stem very variable in length, brown, sometimes grey and fertile on one side.

232. **X. phosphorea**, *B.* Rufa; stipite brevi cylindrico striato in clavam brevem sursum dilatato; peritheciis superficiem in verrucas læves elevantibus; disco pallido, ostiolis prominulis nigris. *Mull.* no. 8.
Victoria.

233. **Hypoxylon concentricum**, *Grev.*; *Schomb.* no. 7.
Adelaide.

234. **H. sclerophæum**, *B. & C.* Expansum, pulvinatum, crassum, superficie rubiginosa subtiliter e peritheciis prominulis rugosa, contextu duro nigro; peritheciis oblongis. *Schomb.* no. 54.
Adelaide.

Closely allied to *H. rugosum*, but thicker; and even specimens from Surinam are marked by Schweinitz *Sphæria durissima*, Sch.

235. **Sphæria perisporioides**, *B. & C.*
On *Desmodium Tasmaniæ*. River Mitta Mitta, Jan.
Sporidia biseriate, uniseptate, ·001 long.

On the Marine Algæ of the Island of St. Helena.

By G. Dickie, M.D., F.L.S.

[Read March 7, 1872.]

There is a very excellent summary of the land-plants of St. Helena in Dr. Hooker's lecture delivered at the Meeting of the British Association at Nottingham in 1866. The original plants are almost extinct; and, from what is known, the inference is, "it resembles none other in the peculiarity of its indigenous vegetation, in the great rarity of the plants of other countries, or in the number of species which actually disappeared in the memory of living man." Of the forty-five indigenous species, forty are absolutely confined to the island, and no fewer than seventeen have been referred to peculiar genera. As to the affinities of the flora, it is regarded as an African one, and characteristic of Southern Extratropical Africa.

I am not aware of any previous notice of the marine Algæ of this interesting island; and although the present list may not comprehend all the species, I have thought that, in the mean time, those known may be worthy of record.

I am indebted to Mr. J. C. Melliss for the materials, having, at his request, undertaken to name the Algæ collected by him.

In a note he stated, "the collection includes *all* that grow on the coast of St. Helena; at least, they are all I could find: it is just possible some few small species may have escaped my notice, though I searched carefully. There were no large olive-coloured Algæ on the rocks; and the species are difficult to find, because there is no tide beyond 2 feet 6 inches. The rock is volcanic, being basaltic lava; there is a strong current from the southward, it comes right on from the Cape of Good Hope."

I. MELANOSPERMEÆ *.

Family Dictyotaceæ.

Padina pavonia, L.

Geographical Distribution:—South Britain, France, &c., United

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* Mr. Melliss sent me the root and part of the stem of a large species several feet in length, which comes on shore in a battered state on the southern side of the island; from structure I believe it to be *Eclonia buccinalis*, a well-known Cape species, and doubtless drifted from that quarter.

States, Mediterranean, West Indies, Red Sea, Indian Ocean, Cape of Good Hope, Mauritius, Australia, New Zealand.

II. RHODOSPERMEÆ.

Family LAURENCIACEÆ.

Laurencia cruciata, Harv.

Geographical Distribution :—Western Australia.

This species is very near *L. obtusa*, Lamx., which is widely diffused in both hemispheres.

Family CORALLINACEÆ.

Corallina carinata, Ktz.

Geographical Distribution :—Cape of Good Hope.

Amphiroa fragilissima, Lamx.

Geographical Distribution :—Cuba, Eastern India, Mediterranean.

A. exilis, Harv. ?

In such fragmentary condition, that I mark it as rather doubtful.

Geographical Distribution :—Cape, Brazil, Mediterranean.

Lithothamnion crassum, Philippi.

Geographical Distribution :—Mediterranean.

L. brassica-florida, Harv.

Geographical Distribution :—Algoa Bay.

Examination of specimens from Algoa Bay leads me to conclude that these two species are most probably forms of one.

Melobesia farinosa, Lamx.

Geographical Distribution :—Very generally in both hemispheres.

Family GELIDIACEÆ.

Pterocladia lucida, Br.

The specimens are very dwarf, about an inch in height, cæspitose, and varying in ramification. The presence of a nerve at the base, minute structure, &c. leave no doubt as to the genus and species; it is, however, very unlike the luxuriant forms from Australia; the late Prof. Harvey considered the plant to be quite as variable as *Gelidium corneum*.

Mr. Melliss found it on the shells of Limpets cast on shore on the northern or leeward side of the island.

Geographical Distribution:—West and south-west coasts of Australia, New Zealand, Ceylon; specimens from the latter are also very dwarf.

Family HELMINTHOCLADIEÆ.

Liagora viscida, Forsk.

Geographical Distribution: — West Indies, Azores, Indian Ocean, Red Sea, Eastern Australia.

Galaxaura lapidescens, Lamx.

A single specimen, small, but quite characteristic.

Geographical Distribution:—Canaries, Red Sea, Indian Ocean, Mauritius, Madagascar, Australia.

Family CRYPTONEMIACEÆ.

Grateloupia filicina, Wulf.

The ordinary form, 2 to 3 inches in length, and also the var. *ramentacea*.

Geographical Distribution:—Atlantic shores, Canaries, Mediterranean, East Indies, Ceylon, Java, Cape of Good Hope.

Family CERAMIACEÆ.

Centroceras clavulatum, Ag.

Very dwarf, growing attached to *Corallina carinata*.

Geographical Distribution:—Florida, Mediterranean, Canaries, Indian Ocean, Rio Janeiro, Callao, Vera Cruz, Cape, Mauritius, Sandwich Islands, Tahiti, Australia, Tasmania, New Zealand.

Griffithsia setacea, Ellis.

Very dwarf, and adherent to other species.

Geographical Distribution:—Atlantic and Mediterranean coasts of Europe, Canaries, New Zealand, Australia.

III. CHLOROSPERMEÆ.

Family SIPHONACEÆ.

Codium tomentosum, Stackh.

Very dwarf.

Geographical Distribution:—Nearly cosmopolitan, throughout tropical and temperate oceans in both hemispheres; Antarctic seas.

Family VALONIACEÆ.

Valonia verticillata, Ktz. ?

A few specimens only, and those very indifferent: it may be new; for the present I prefer to consider it a slender and less branched form of the above species.

Geographical Distribution:—Vera Cruz.

Family ULVACEÆ.

Ulva latissima, L.

Mr. Melliss found this to be the most common of all the Algæ.

Geographical Distribution:—Generally distributed in temperate and colder oceans.

Enteromorpha, sp.

Mere fragments only, found adhering to *Laurencia cruciata*, the structure evidently the same as that of *Enteromorpha percursa*, Hook., but too imperfect for identification.

Summary.—There is therefore only one representative of the olive, thirteen of the red, and four of the green series.

With the exception of *Padina*, *Laurencia cruciata*, and *Liagora viscida*, all are very dwarf*.

Excluding the *Valonia* and *Enteromorpha*, which can scarcely at present be taken into account, there is not a single form peculiar to the island; all are plants more or less widely diffused; and most of them occur on both sides of the equator.

Mr. Melliss states that the seaweeds are found principally along the south coast—that, namely, which is freely exposed to the current from the Cape, and partly also to any current influenced by the constant south-east trade wind.

Not having access to any complete list of Cape Algæ, I can only say at present that about one half of the species are also found there; *Laurencia cruciata* is an Australian form; and, with the exception of Ceylon, *Pterocladia* also belongs to the same region.

On the supposition that the species here enumerated give a fair idea of the Algæ of St. Helena, it is rather notable to find so few belonging to an island ten miles long by seven broad. It is probable, however, that islands of moderate or small size, very distant from any continent, have but a scanty marine flora. And here it may be worthy of notice that the island of Kerguelen (much further removed from any continent) has eight olive, nineteen red, and twelve green (thirty-nine in all) of marine plants, and, in proportion, is therefore not richer in this respect than St. Helena; but of these, five are, I believe, so far as known, peculiar to that island, all the others being derivatives; and, like those of St. Helena, many of them have a wide distribution in both hemispheres; a few are South-American species.

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* In an account of the Algæ of the Maiden Rocks, two mere islets of basalt, about six miles distant from the nearest coast of Antrim, North of Ireland, I have recorded five olive, nineteen red, and seven green species, mostly all very small in size, whereas the Antrim coast is specially notable for the great number of British species (probably two thirds), and for the dimensions attained by many of them. (See Trans. Edinburgh Botanical Society, 1871.)

Remarks on *Mesotus*, Mitten. By S. O. LINDBERG, M.D. Communicated by Dr. BRAITHWAITE, F.L.S., &c.

[Read March 7, 1872.]

IN a fine collection of mosses and lichens recently received from Dr. Knight, of Auckland, New Zealand, I found a large tuft of *Sticta carpoloma*, Del., which had been growing on bark; and out of this I picked three single stems of the very curious *Mesotus celatus*, Mitt., in Hook. f. Handb. N. Zeal. Fl. ii. p. 462 (1867), each of which bore one or two mature fruits.

Though the stems from Dr. Knight are not so dense as the small specimen gathered by Messrs. Hector and Buchanan and kindly sent to me by Dr. Hooker (but bearing only a single very old fruit), they agree perfectly with it. But were the original specimens really found "on dry banks"? I think not; for, judging from the few stems from Dr. Knight, and from the habit of the plant, I conclude that it lives on the bark of trees and on stones, in the latter case becoming more densely tufted, like the Otago specimens (H. & B.).

As the opinions of Dr. Schimper and Mr. Mitten respecting its systematic position are very opposite, the former considering it "to be truly pleurocarpous, and allied to *Esenbeckia*" (Garovaglia), the latter being disposed to place it amongst the acrocarpous mosses, I have endeavoured to settle the point by investigating the structure, and beg now to offer the result of my observations on the specimens from Dr. Knight.

The primary stem is creeping, about two inches long, and beset with dark radicles, as also are the branches, which are arcuato-recurved, and three inches high. The female inflorescence is *terminal*, containing about twelve pistillidia, which are slender and long-stipitate, as usually seen in *Dicraneæ*, the paraphyses only half as long, filiform, and not numerous. Very early, under the impregnated inflorescence, the stem sends out an innovation from the axil of the uppermost leaf (not from the axil of a bract, which is, I think, the prime difference between the leaves and bracts in acrocarpous mosses), which also soon produces a female flower at the very top.

In this way the fruit is pseudolateral, just as the flower in the inflorescence, now called *bostryx*, or *cyme hélicoïde unipare*, in the higher plants. The bracts forming the perichætium are twelve to sixteen in number, and, from a very broad base, suddenly attenuated to a subulate point; the base is nearly round, thin, glossy, and pellucid, concave, and convolute; the subula long, slender, flexuose, undulate, and carinate, with the margin densely and sharply serrulate, the nerve not excurrent, and also sharply serrated above on the back. The basal cells are prosenchymatous, incrassated, and porose between one another, the angular cells large, brown, rectangular, and quadrate; the upper cells of the base, as also the parenchyma of the point, form longitudinal rows, and are minute, quadrate, strongly incrassate, with very small, nearly stellate or angular lumen, and warted on both sides: but the cells of the margin form an obscure border, being prosenchymatous in the lower part of the subulate point, oblong-rounded in its upper part, and all larger, more incrassated, and quite smooth; this border is broadest in the upper part of the round base, and nowhere perfectly defined from the parenchyma of the bract.

The leaves are shorter, broader, with a narrower base, less decidedly narrowed to the point, the areolation firmer, with more distinct angular cells, and the nerve nearly smooth on the back. The seta is very short; and no stomata could be seen on the theca, which is composed of irregularly rectangular quadrate, strongly incrassated cells. I was unable to detect any real annulus or trabeculæ on the inside of the *Grimmia*-like teeth, which are sometimes cleft at the apex. The spores are very large, about half the size of those in *Archidium* and *Gigaspermum*, smooth, with a strong, thick exospore (besides these normal ones, I found numerous spores double the size, composed of sixteen to twenty small cells; but having only two thecæ at my disposal, I feel unable to decide whether this curious dimorphism of the spores is normal or a deformity); all of them are globoso-tetrahedral, but the larger sometimes oval. The calyptra was absent in all the specimens.

This interesting moss has the habit of *Macromitrium*, Brid. Mant. Musc. p. 132 (1819), in *Orthotricheæ*; the form of the leaves is like that in *Holomitrium*, Brid. Bry. Univ. i. p. 226, no. 21 (1826), in *Dicraneæ*; but the form of the perichætial bracts resembles the leaves of *Symblepharis*, Mont. Ann. Sc. Nat. ser. 2, viii. p. 252 (1837), among *Ditricheæ* (Leptotricheæ). The structure and areolation of the bracts agrees well with that of *Macrodon*, W. Arn. in Mém. Soc. d'Hist. Nat. Paris, ii. p. 299, n. 45, 1825 (*Walkeria*, Hornsch. in Flora, viii. pt. 2, Ergänz. p. 21, 1825; *Leucoloma*, Brid. Bry. Univ. ii. p. 218, n. 97, 1827), a link of *Dicraneæ veræ*.

According to this structure of the leaf, *i. e.* the distinct brown alar cells, the minute areolæ of the parenchyma, with strongly incrassate walls, and very small nearly stellate lumen, and warts on both sides, as also the distinct border at the margin, I think *Mesotus*, Mitt., must be placed among *Dicraneæ veræ*, near to *Macrodon*, W. Arn., in which group it forms a link analogous to *Desmotheca*, Lind. (*Cryptocarpus*, D. M. Musc. frond. Arch. Ind. p. 5, 1844, and Musc. frond. ined. Arch. Ind. fasc. ii. p. 37, t. 15, 1845; but, in *Chenopodiaceæ*, there is already a *Cryptocarpus*, H., B., K. Nov. Gen. Sp. Amer. ii. p. 187, tt. 123 & 124, 1817), of *Orthotricheæ*. About the male inflorescence I can say nothing, as I have not been able to find any andrœcium; probably the plant is diœcious.

In speaking of the cells, I have used the term *warts*; and perhaps it will not be out of place to glance at the asperities on the cells of Mosses and Liverworts, as they are often of great use in systematic arrangement. We have, I think, the following three principal forms of asperity, of which the first two are occasioned by the prominence of the cell-wall itself, the last by excrescences from the cuticle only.

1. *Cellulæ pulvinatæ*—when the wall of the cell is, on one or both of its free sides, regularly round-convex, as in *Rhabdoweissia striata*, and very many *Hepaticæ*.

2. *Cellulæ papillosæ*—when the wall of the cell is, on one or both of its free sides, conically prominent, either at the middle of the wall or at one or both ends, as in *Bartramieæ* and *Lejeunia echinata*, &c.

3. *Cellulæ verrucosæ*—when the outside of the cell-wall shows small tubercles or warts, entire or from 2- to many-cleft, often stellate at their apex, as in *Orthotricheæ*, *Pottieæ*, &c., and in *Scapania æquiloba*, *S. chloroleuca* (forming a proper genus, which I call *Schistocalyx*), *Southbya verrucosa*, n. sp. from Amur, &c.

Helsingfors, January 10, 1872.

New Leguminosæ from Western India. By N. A. Dalzell, A.M. (Communicated by Dr. Hooker, V.P.L.S. &c.)

[Read March 7, 1872.]

1. **Atylosia geminiflora**, *mihi*. A basi ramosa, ramis erectiusculis flexuosis pilis fulvis patulis villosis, foliis longe petiolatis, foliolis rotundatis, petiolo subduplo brevioribus, utrinque parce hispidulis, stipulis e basi lata auriculata acuminatis, pedunculis axillaribus vel in ramulis summis aphyllis valde distantibus, bifloris, pedicellis pedunculo brevioribus fructiferis recurvis, bractea acuta suffultis; legumine lineari compresso submembranaceo, basi apiceque rotundato, mucronato, pilis bulbosis hispido, transverse valide venoso, et lineis depressis 4–6 notato, 5–7-spermo, seminibus scarabæoideis, rubro et nigro maculatis.

Foliola membranacea, trinervia, pellucido-punctata, glandulis aureis conspersa 1½–2½ poll. longa et lata. Petiolus 3 poll. longus. Calycis tomentosi laciniæ acuminatæ, tubo duplo longiores. Vexillum angustum, obovatum, reticulatum, 6–7 lin. longum, auriculis inflexis. Legumen 1–1½ poll. longum, ½ poll. latum.

Hab. Western India.

This plant has foliage in appearance much like the Nomismias. The legumes are of the same shape as those of *Atylosia scarabæoides*, but they are more compressed; the valves are of much thinner texture, and rather papery. The seeds, which are oblong, with large shining bifid caruncula, are enveloped each in a very thin membrane, which lines the cavity in the valves. There is an interval of 4 inches between each pair of flowers on the terminal branches.

The authors of the new 'Genera Plantarum' have denied stipels to the genus *Atylosia*; they are present on this plant and also on the following.

2. **Atylosia glandulosa**, *mihi*. Volubilis, ramis teretibus striatis brevitomentosis, foliis longiuscule petiolatis, foliolis lateralibus ovatis acutis valde inæquilateris, terminali latissimo rhomboideo, utrinque

hispidulis subtusque glandulis rubris conspersis, stipulis parvis acutis; racemis pedunculatis axillaribus vel terminalibus, folio longioribus, pedicellis solitariis, fructiferis retrofractis; leguminibus compressis horizontalibus linearibus acutis 8–9-spermis, valvis oblique inter semina depressis, pilis flavis bulbosis hispidis.

Foliola 1½–2 poll. longa; petiolus 2–2½ poll. longus; legumen 3 poll. longum, 6 lin. latum. Flores flavi, speciosi, vexillum latissimum bicallosum. Calycis muricati laciniæ superiores et laterales brevissimæ, inferior longior acuminata. Semina semiovata, nigra, punctata.

Hab. Bombay.

This plant comes near to the *Dolichos punctatus* (*A. punctata*, mihi) of Wight and Arnott, but is certainly distinct, as the stipels, which are wanting in that species, are present in this. *Dolichos punctatus* seems to be a species of *Atylosia*, as well as *Cajanus Kulnensis* and *Goensis*, from Bombay, both of which are furnished with stipels.

Note.—Messrs. Wight and Arnott, in their 'Prodromus,' state that they were induced to separate four species of plants from *Cajanus*, DC., on account of their persistent corolla, the absence of callosities, the large caruncuIus to the seed, and the foliage, which was palmately trifoliolate, and not pinnately so as in *Cajanus*; and now these four species are associated with others, from which they differ very much in habit and appearance, and which have all the peculiarities which induced the separation from *Cajanus* except the large caruncuIus to the seed. In fact, *Atylosia Candollii* and its congeners are so like *Cajanus indicus* in their erect, twiggy, suffruticose habit, that the natives of India call them both by the same name, *Cajanus* being the Toor, and *Atylosia Lawii* being the Rantoor or wild Toor. As regards the callosities on the vexillum and the foliage, these are, according to my experience, of specific value only. *Atylosia*, as now established, differs from *Cajanus* only in having the bifid caruncuIus large, while in *Cajanus* it is very small.

3. RHYNCHOSIA MOLLISSIMA. Subvolubilis, tota velutina, ramis striatis, foliis petiolo longioribus, foliolis lateralibus late ovatis, terminali rhomboideo, omnibus brevissime acuminatissimis, stipulis parvis ovato-acuminatis adpressis, stipellis 0? racemis axillaribus simplicibus vel ramosis, pedunculatis, folio duplo longioribus, multifloris; floribus flavis solitariis, pedicellis bractea lanceolato-acuminata caduca 3-plo brevioribus; legumine falcato 2-spermo basin versus angustato, apice obtuso.

Calyx 4–5 lin. longus, lacinia inferior longior. Bracteæ 3 lin. longæ.

Vexillum 8 lin. longum, dorso tomentellum, *ecallosum*, exappendiculatum. Stylus apice incrassatus. Legumen 1½ poll. longum, rostro brevissimo.

Hab. Banks of the Girnar, in Kandesh.

This species has larger flowers and shorter racemes than *R. sericea* (Spanogue)=*Dolichos tomentosus* (Roth), which grows in the same district, and which is remarkable for its viscosity and a very dark purple vexillum. This latter species is furnished with callosities and inflexed claws to the vexillum. The present species seems closely allied to the *R. acuminatissima* (Miquel) from Java, but appears to have closer and finer pubescence and much shorter pedicels; it is not at all glutinous.

4. **Milletia pallida**, *cum icone*. Alte scandens; racemis foliolorumque juniorum pagina inferiore tomento brunneo sericeo velatis, demum glabratis; foliolis 5–7-jugis oblongis vel obovato-oblongis, subito obtusiuscule acuminatis, membranaceis; racemis solitariis axillaribus terminalibusque, folio brevioribus, pedunculis brevibus solitariis, bractea lineari acuminata suffultis, calycis tomentosi labio superiore subtruncato, labio inferiore 3-dentato, vexillo glaberrimo exappendiculato; legumine angusto lineari, coriaceo, toruloso, seminibus paucis distantibus *ovoideis*.

Folia 1 pedem longa, foliola 3–4 poll. longa 1½–2 poll. lata, basi sæpius cuneata, subtus pallida, adulta subglabra. Stipulæ subulatæ 5 lin. longæ. Racemi 3–9-pollicares, per totam longitudinem floriferi. Bracteæ lineares, acuminatæ, 5–6 lin. longæ, per anthesin deciduæ. Pedicelli 2–3 lin. longi. Vexillum latum, 5 lin. longum, ungue brevissimo. Alæ latæ obtusæ. Carina alis brevior. Stamen vexillare liberum. Nectarium tubulosum apice crenatum. Ovarium glabrum, brevistipitatum, ovulis 6. Stylus glaber incurvus; stigma capitatum. Legumen inter semina compressum, coriaceum, 4–8 poll. longum, 6–7 lin. latum, demum vix dehiscens. Semina ovoidea pallida, radicula brevi conica.

Hab. Wassorona forest, Bombay. Very rare.

This climbing shrub is very like our garden *Wistaria* in habit, appearance, and foliage. It is an exceedingly interesting plant, as the legume differs considerably from the two types of pod which have been recognized as peculiar to this genus; these types I take to be (1) a woody pod with slightly convex valves like that of *Pongamia glabra*, the other a much compressed pod with thickened margins somewhat similar to several of the genus *Bauhinia.* The pods of the present species have a very imperfect dehiscence; the outer coriaceous layers of the valves open eventually; but the inner parchment-like membrane remains, permanently enclosing the seeds, which are neither orbicular nor reniform, but ovoid, and so entirely like those of *Sophora* as to suggest a close affinity with that genus. If my memory serves me right, the *Robinia racemosa* of Roxburgh (*Tephrosia racemosa*, W. & A.) is closely allied to this new species of *Millettia*, and has the same remarkable legume and seeds. This latter is found on the banks of the Black River in North Canara (lat. 15°), and is in the late Dr. Ritchie's collection. To the north of the Nerbudda, in lat. 23°, I fell in with another *Millettia*, the *Robinia macrophylla* of Roxburgh, in which the legume is of moderate size, very much compressed throughout, and clothed with short ferruginous tomentum.

There are no others of the genus, as far as is known, to be found in the Bombay Presidency.

5. BAUHINIA (PILEOSTIGMA) FOVEOLATA, *mihi*.

Dioica, scandens? foliis amplis integris glabris 14–16-nerviis petiolo sinum profundum angustum æquante; floribus (fœm.) parvulis terminalibus, in ramis alternis brevibus divaricatis confertim racemosis, brevipedicellatis, ovario stipitato tomentoso 18–20-spermo, stigmate crasso peltato.

Folia 8–10 poll. longa et lata, utrinque glaberrima, subtus reticulata et *foveolata*. Calyx 7 lin. longus, cylindrico clavatus, glaber, ferrugineus, leprosus, dentibus brevibus, ovatis acutis. Petala 6–7 lin. longa, longiuscule unguiculata, calycis medio tubo inserta. Antheræ fertiles nullæ, staminum rudimenta 10, alterna breviora, tori margini inserta; stylus brevissimus; stigma pileiforme. Legumen?

I have but one, imperfect specimen of this plant, which I have every reason to believe was gathered in western India by the late Dr. Gibson. The structure of the under surface of the leaf is very curious. There are numerous pits within the small areolæ of the reticulations; and each is tenanted by one minute seed-like body attached to the cavity by a fine thread!!

On Zoopsis, *H.f. & T.* By S. O. LINDBERG, M.D.

(Communicated by Dr. BRAITHWAITE, F.L.S.)

[Read April 18, 1872.]

HAVING recently received from the detector of this curious Liverwort, Dr. J. D. Hooker, a little tuft, gathered in Tasmania by Mr. Oldfield, which shows all the parts of fructification in a most perfect state, and as, in my opinion, it has a very artificial place in

the series of Jungermanniaceæ, and the male plant is also undescribed, I think it will not be out of place to give first a complete description of the whole plant.

Planta thalloides, *Phyllocactum* vel *Epiphyllum* in memoriam haud male referens, alba, pellucida, in sectione transversa oblonga vel elongate oblonga, ideoque complanata. *Caulis* bifurcatione apicis ramosus, ramis elongatis, maxime pellucide areolatus, cellulis lævissimis inflatis, latere dorsali e seriebus duabus vel tribus cellularum corticalium formatus, latere ventrali e seriebus 6–8 cellularum multo minorum corticalium ædificatus, fasciculo centrali cellulis 8–12, pleurenchymaticis, angustissimis et longissimis, optime distincto; latere ventrali ad secundum quidque folium rudimentarium in linea mediana, fasciculum centralem obvelante, adsunt quatuor cellulæ minores, quam superiores et inferiores medianæ, ad quas quatuor minores cellulas interdum, præsertim infra apicem caulis vel ramorum, affixæ sunt duæ aliæ minimæ et prominentes cellulæ, quæ sine dubio amphigastrium repræsentant, et eisdem locis penicillus radiculorum interdum progreditur, ut et ramulus fertilis vel androecium. *Folia* maxime rudimentaria, disticha et alternantia, solum e cellulis duabus vel tribus, maximis, subglobosis formata, sed setulam apicalem, ab auctoribus descriptam, nullibi invenimus in speciminibus nostris Tasmanicis, Aucklandicis, vel Javanis. *Ramulus* fertilis brevissimus, ad basin vel medium caulis e latere ventrali in linea mediana ejus egrediens (confer supra), ad basim parum radicans et haud foliatus, superne tribus paribus accrescentibus bractearum obtectus, quæ bracteæ sunt oblongæ, in ipsa basi fissæ, segmentis subulatis, incurvis, e duabus seriebus cellularum maximam partem constructis; amphigastria nulla adsunt, sed in linea mediana ventris cellulæ alternatim inter bracteas prominentes (confer supra). *Colesula** obconico-oblonga, laxissime texta, teres et sine plicis, apice ad tertiam partem altitudinis irregulariter 6–8-lobata, segmentis subulatis, incurvo-conniventibus. *Calyptra* maxima, gymnitriea. *Seta* sat brevis, crassiuscula, laxissime texta. *Theca* globosa, brunnea, in basi fissa, valvulis ellipticis, obtusiusculis, e duobus stratis cellularum, quorum interior e cellulis pulcherrime brunneo-annulatis componitur. *Sporæ* minutæ, brunneæ, sublævissimæ, perfecte globosæ. *Elateres* longi, obtusiusculi, valde flexuosi, spiris duabus, intense brunneis.

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* As we now know, the "*calyx*" or "*perianthium*" of Liverworts does not exist previous to the pistillidia, but grows out after these female organs, in a ring from the receptacle on which the pistillidia are fixed. Its development is thus posterior; and it serves only as an external sheltering cover for the fruit during its development. It therefore cannot be regarded as a part analogous to the *calyx* or *perianthium* of higher plants, but is an organ peculiar to the *Hepaticæ*, though in them not always present. Already (in 1793) in his now too much neglected work 'Elementa Botanica,' iii., Dr. N. J. de Necker used for it the term *colesula*; and after him M. B. C. Dumortier, in his important publications 'Commentationes Botanicæ,' 1823 (the preface is dated July 3, 1822), 'Sylloge Jungermannidearum Europæ,' 1831, and 'Recueil d'Observations sur les Jungermanniacées,' Fasc. I., "Révision des Genres," Tournay, 1835. And this term *colesula* I shall hereafter adopt.

Planta mascula femineis intermixta et simillima. *Andrœcium* est basilare vel infra medium caulis e ventre ejus egrediens (confer supra), breve, spiciforme, oblongum, obtusum. *Bracteæ* circiter 6–10, alternantes, concavæ, subrotundæ, bidentatæ, dentibus incurvis et acutiusculis, sinu semilunari, cellulis circiter 20, magnis, pellucidis. In unaquaque axilla adest antheridium globosum, breviter stipitatum, colore flavidulo, sine vestigio paraphysium. *Ventre* rachidis inter bracteas posita est cellula una vel duæ prominentes, quæ sine dubio amphigastria rudimentaria repræsentant (confer supra).

This seemingly solitary plant is, according to the above characters, closely allied to the *Cephalozia** *connivens* (Dicks.) Dum.,

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[*] From Professor L. Piré, of Brussels, I received in the autumn of last year a copy of the latest work of M. Dumortier, entitled "Recueil . . I." (*vide supra*), printed in the year 1835! It contains a good many genera, most of which are very natural, and afterwards described under other names by different authors. As this important little pamphlet (only 28 pages) is hitherto totally unknown to hepaticologists, and also is absent in the 'Thesaurus Liter. Bot.' of Dr. Pritzel, it may not be out of place to mention the genera which must keep the names given by M. Dumortier—besides that he has here, first of all, given the same circumscription, or very nearly so, to *Radula*, *Scapania*, *Plagiochila*, *Lophocolea*, and *Lepidozia* as they have at present.

Lepidolæna (p. 13, n. 8) = Polyotus, *Gottsch. in G. L. N. Syn. Hep.* fasc. ii. p. 244, n. 27 (1845). Optime!

Pleurozia (p. 15, n. 12) = Physiotium, *N.-Es. Naturf. eur. Leberm.* iii. p. 75, n. 3 (1838). Optime!

Schistochila (p. 15, n. 13) = Gottschea, *N.-Es. in G. L. L. Syn. Hep.* fasc. i. p. 13, n. 6 (1844). Optime!

Diplophyllum (p. 15, n. 14) = Diplophyllum, *Lindh. in Act. Soc. Sc. Fenn.* x. p. 31, nn. 1831, 2, in obs. (1871). Bene!

Blepharozia (p. 16, n. 15) = Jungermannia, sect. 2. Blepharozia, *Dum. Syll. Jung. Eur.* p. 46 (1831), = Ptilidium, *N.-Es. Naturg. eur. Leberm.* i. p. 95, n. 2 (1834); sed Ptelidium, *P.-Thouars, Hist. Vég. Iles Austr. d'Afr.* t. ii. (1806), ad *Celastraceas* pertinet. Bene!

Cephalozia (p. 18, n. 21) = Zoopsis *H. f. & T. Crypt. Antarct.* p. 55, n. 22 (1845), = Trigonanthus, *Spruce in Trans. Bot. Soc. Edinb.* iii. p. 207 (1849). Optime!

Anthelia (p. 18, n. 22) = Chandonanthus, *Mitt. in Hook. f. Handb. N.-Zeal. Fl.* ii. pp. 750 et 753, nn. 2, 2 (1867). Bene!

Blepharostoma (p. 18, n. 23) = Chætopsis, *Mitt. in Journ. L. Soc.* viii. n. 29, p. 51 (1864). Bene!

which possesses very nearly the same structure of stem and of the organs of fructification. The most obvious difference is that the latter has well-developed vegetative leaves, but these leaves in the former, together with the stem, form a continuous Cactus-like frond. It may be of interest to mention here what Dr. R. Spruce, one of the most accomplished observers of any age, has said about the matter in a letter dated December 22, 1871:—"I have a very curious set of *Trigonanthi* from the Amazon valley; and I studied them well on the spot very many years ago. I have species with bifid leaves, others with entire or subentire leaves, and others with the leaves combined into a continuous frond (!), when they become the *Zoopsis* of Taylor. But in every species *the bracts*, whether of the ♀ or ♂ flower, *are normally bifid* (dein 3–4-fidæ)." With this very acute observation my own opinion perfectly coincides. And therefore hereafter *Zoopsis argentea* must be called *Cephalozia argentea*.

About the limitation of the genus I am not yet quite certain. In *C. connivens, bicuspidata, curvifolia* *, *catenulata, Francisci* the fertile branchlet is almost always very short † and arises from the axil of an amphigastrium; *i. e.* they are what I will call gastrogynous; the ♀ branchlet never shoots out innovations from the axils of the subbracteal leaves ‡, if it bears any such, which is very seldom the case, and the colesula is usually distinctly trigonous. This section is formed, I think, by the true *Cephaloziæ*. But *C.*

Odontoschisma (p. 19, n. 25)=Sphagnœcetis, *N.-Es. in G. L. N. Syn. Hep.* fasc. ii. p. 148, n. 10 (1845). Optime!

Lepicolea (p. 20, n. 29)=Leperoma, *Mitt. in Hook. f. Handb. N.-Zeal. Fl.* ii. pp. 751 et 754, nn. 18, 1 (1867). Optime!

Hymenophyton (p. 25, n. 42)=Symphyogyna, *M. N. in Ann. Sc. Nat.* 2ᵉ sér. v. p. 66, n. 7 (1836). Optime!

Acrostolia (p. 26, n. 44)=Pseudoneura, *Gottsch. in Ann. Sc. Nat.* 5ᵉ sér. i. p. 184, n. 24 (1864). Optime!

* On *C. curvifolia* I have made the following observation:—

Planta autoica, ramulus ♂ inter easdem ♀ sat elongatus, bracteis majoribus quam folia, minus concavis et magis irregularibus, antheridium singulum in axilla, amphigastriis andrœcii bene evolutis, integris, colesula extus sæpissime spinulosa.

† Only in *C. bicuspidata, catenulata,* and *curvifolia* have I seen the fertile branch to be sometimes elongated.

‡ In Mosses and Liverworts the bracts, both male and female, are distinguished from the true vegetative leaves by the constant absence of innovations from their axils.

Turneri and *dentata*, which possess subcomplicate leaves, nearly as in *Jungermania Helleri* &c., *C. byssacea*, *islandica*, and *albescens* seem to have the female inflorescence in the very apex of the stem, *i. e.* acrogynous, although, by the growing-out of long branches from the lower axils of the vegetative leaves, it soon becomes lateral; I have at least never found on them a gastrogynous perichætium; this fertile branch very often gives rise, from a lower axil, to a second of the same nature, and this to a third one; and the colesula is never trigonous, but always terete and plicate. These species, forming the latter series, may be, I think, taken out from *Cephalozia* and brought over again to *Jungermania*.

In the description of *C. argentea* I have used a new term for the calyptra (*gynomitriea*), which wants illustration.

In 'Synopsis Hepaticarum'* we find the Liverworts divided into five tribes: Jungermanieæ, Monocleæ, Marchantieæ, Anthoceroteæ, and Riccieæ. Dr. Gottsche, who is best acquainted with these plants, has proved (see 'Botanische Zeitung,' 1858, nn. 38 and 39) that *Monoclea* is most allied to *Blasia*, and must thus be among *Jungermanieæ frondosæ*, and *Calobryum* is a very dubious plant. In my 'Musci Novi Scandinavici' (1868), p. 296, I have pointed out that *Riccieæ* bear the same relation to *Marchantieæ* † as *Phasceæ* do to more highly developed Mosses. Of five tribes, thus but three are left, viz. *Marchantieæ*, *Jungermannieæ*, and *Anthoce-*

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* This work was not published entire in the same year, but in five different fascicles:—

Fasc. 1, pp. 1–144, 1844.
„ 2, „ 145–304, 1845.
„ 3, „ 305–464, 1845.
„ 4, „ 465–624, 1846.
„ 5, „ 625–834, 1847.

† On this subject my friend Dr. Carrington, of Eccles, makes the following very important remark in a letter of Aug. 21, 1870:—"I see you arrange *Sphærocarpus* among the *Marchantiaceæ*. Most people have been misled by the external resemblance to the *Riccieæ*; but the structure of the frond is altogether simpler, wanting the pores and lacunose stratum of the *Marchantiaceæ*; and, after careful study, I believe its true place is with *Jungermanniaceæ*, of which it is a gymnocarpous form, holding the same relation to *Aneura* &c. that *Riccia* does to *Marchantia*. There is another solution of the question: it may be placed with *Anthoceros* as a degraded form of the *Hepaticæ*." The former of these two interpretations is, I think, an ingenious and natural one, especially as I am unable to discover on the underside of the thin frond any cells with clavulate incrassations on their inside, which cells are peculiar to all the *Marchantieæ* and *Riccieæ* (*Marchantiaceæ*); but the latter is quite opposed to the structure and development of the fruit in the *Anthocerotaceæ*.

roteæ, all three so very distinct in their development, vegetative and fructificative organs, that we must regard them all as proper families.

The calyptra, that most peculiar organ of Mosses and Liverworts (*plantæ calyptratæ*), must be considered separately in these three orders. In *Anthocerotaceæ* it must, of course, be absent, because in them the oogonium (central cell) lies in a small concavity of the thallus, and is quite naked, wanting the usual cover of cells, and sheltered only by the walls of the cavity of the thallus itself. And, indeed, the *Anthocerotaceæ* are, of *Muscineæ*, the only ones which possess no veil at all.

In *Marchantiaceæ* (Marchantieæ and Riccieæ) the calyptra is formed in the usual way by the enlarged cellular cover (at the top narrowed into a perforated style and stigma) around the central cell of the germen, which cover shelters the theca during its development from cold and drought. In *Marchantiaceæ* we thus find that the calyptra always preexists in the unimpregnated pistillidium (archegonium), and is the organ which I will call *gynomitrious* (from γυνή, *pistillum*, and μιτρίον, *calyptra*). But in *Jungermanniaceæ* we see two different forms of cover for the increasing theca, one of which is the usual *calyptra gynomitriea*, the other an excavation in the very rachis of the female inflorescence (*calyptra thalamomitriea*). As the former is well understood and already mentioned above, I have now only to explain the latter. We will, for this purpose, select a good example, *e. g.* the development of the fruit in *Trichocolea tomentella* (Ehrh.), Dum.

In this Liverwort the young perichætium is acrogynous; and under it, from the uppermost axils of the true leaves, the stem is elongated by an innovation from each side, rarely by only one, in which case the perichætium seems to be axillary and lateral; but really it is what is named *inflorescentia oppositifolia* in higher plants. The perichætium is at first small and short, everywhere covered by a felt of small bracts, filiform, branched, and intricate, like some *Cladophoræ*, without any constant position, size, or form; also the top of it, which is somewhat convex, possesses a pretty dense tomentum of such, but smaller, conferva-like bracts (*paraphyses*!). Among them are fixed on the top of the rachis or receptacle an unusually large number of pistillidia of different degrees of ripeness, the central of which are most mature. When one of these has been impregnated, not only its central cell increases in size, but also the very rachis itself ("*ubi irritatio,* *ibi affluxus*!"), especially the latter organ; so that the cellular cover of the central cell with its style and stigma, together with all the other sterile pistillidia, will be raised up; and the young fruit is now completely enclosed in a fig-like obconical pouch, bearing on its top the pistillidia with the empty one belonging to the young fruit (the fertilized out-growing central cell). When the fruit is mature, the seta grows out and pushes * it up from the rachideal pouch, and thus elevates the roof covering the top of the fruit in the form of a disk, bearing the pistillidia and paraphyses on its upper side, and being very fugacious. This form, of cover for the fruit is, in the 'Synopsis Hepaticarum,' called "*calyptra cum perianthio*," vel "*involucro*" vel "*toro concreta*," vel "*connata*;" but it is easily seen that it is quite of a different nature from the usual one; this, namely, belongs to the pistillidium itself; the former, on the contrary, is a part of the rachis (thalamus, receptaculum, axis or stem). In very many of the *Jungermanniaceæ* we see the same *calyptra thalamomitriea*, as in *Lepidolæna, Schistochila*, &c. For the most part, the colesula is also wanting in them, being of no use when the fruit is sufficiently sheltered without it. But in *Schistochila Neesii* (according to 'Syn. Hep.' p. 16) and *Lepidolæna magalhanica* we find a sort of colesula (?); but I think that it must rather be an organ formed by two connate true bracts (i. e. *involucrum gamophyllum*), as the uppermost amphigastrium is situated *within* (!) it. To decide this question, we must examine some very young perichætia: if this organ exists before the ♀, then it is an *involucrum*; but if it grows out later, after the ♀, then it is a colesula.

I opine that we have among the *Jungermanniaceæ* two parallel series, one with *calyptra thalamomitriea*, and the other with *c. gynomitriea*. And in truth not a few of the genera † of the two series are quite analogous, as, for instance, in

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* In a letter dated Dec. 29, 1871, Professor J. de Notaris says:—"J'ai fait la remarque que l'allongement du pédoncule de plusieurs Jungermanniacées est presque instantané(!), à peu près comme le pédoncule de *Phallus* et de *Tulostoma*."

† In *Calypogeia ericetorum*, Radd. (*Gongylanthus*, N.-Es.), the colesula is truly terminal (!), though it seems to be lateral by means of an innovation; once I found such an organ terminal in the dichotomia of two very nearly opposite innovations. This Liverwort has also no amphigastrium from the axil of which the perichætium can grow out. It belongs thus to the *Jungermanniaceæ gynomitrieæ acrogynæ sacciferæ*, and is allied to *Acrobolbus* (*Gymnanthe*, Tayl.), not to *Kantia trichomanis* (L.), Benn., haud Gray! who seems not to be the author of the *Hepaticæ* in the 'Arrangement of British Plants,' as Dr. Carrington writes in a letter of Oct. 31, 1871:—"By the by, I had an inter-

Thalamomitrieæ.	Gynomitrieæ.
Lepidolæna	*Frullania.*
Schistochila	*Scapania.*
Lepicolea	*Herbertia.*
Trichocolea	*Blepharozia.*
&c.	&c.

In both the female inflorescence is either ventral (*gastrogyna*) or terminal (*acrogyna*). If terminal, it may continue so when the stem does not innovate, or, by the growing out of innovations from both sides beneath it, it becomes apical in the dichotomia (confer the *cyma* of higher plants), or soon lateral by the growth of a branch under it, either repeatedly alternate from both sides of the stem (confer the *circinus*, "*cyme scorpioïde unipare*"), or repeatedly from only one side (confer the *bostryx*, "*cyme hélicoïde unipare*"). But *axillar* true perichætia, as in pleurocarpous mosses, seated in the axils of true vegetative leaves, and always composed of no more than a very short axis, bracts, colesula and pistillidia, I have never found in the Liverworts. Such short female branches take their origin only from the axils of the amphigastria; *i. e.* they are always *ventral.* The male inflorescence (*andræcium*) has in most the same position as the perichætium of the same species.

These notes are indeed very fragmentary; but they may suffice for the present, as showing that the question is highly interesting and deserves its own special chapter.

May I be allowed to finish this little paper by a relation of my views as to the reciprocal position of the Liverworts and Mosses in the system of *Muscineæ.* I must then try to answer the question *which of the two may be considered more highly developed?* To give here a detailed exposition of the matter would be tedious; and I must limit myself to the chief points.

And first I must claim for the system of vegetation a nearly exclusive right of decision as to the highest divisions amongst the *Hepaticæ* and *Bryineæ,* because, in regard to their *natural* arrangement, the fruit and its different parts are of use and import-

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esting letter from Dr. Gray; he says that a friend of his, named Bennett, a most promising young botanist, who died early, undertook the *Hepaticæ* in Gray's 'Nat. Arr.'" In *Saccogyna* the leaves are opposite and connate by means of the interjacent amphigastrium, so that all three become coherent.

ance only with respect to the composition of families or orders, and their further subdivision into genera and species.

Hepaticæ are superior to *Bryineæ* chiefly by the following characters:—The polymorphy of all their organs; the spore gives rise to only a single plant; their protonema is short, usually thick, and very little or not at all branched; even in *Pellia* we can hardly speak about such a nurse-stage, as the cells composing the spore are, excepting the root-cell, all stem-cells, by which structure the spore of *Pellia* is near to the globule of the embryo, as we see it in *Pyrolaceæ*, *Orchideæ*, &c. In some frondose forms, as in *Pallavacinia Lyellii*, *Hymenophyton*, &c., a fibro-vascular fascicle formed of distinct bast-like cells is present*; moreover some of them show several different kinds of spiral cells, and the leaves are often opposite and connate. In the true genus *Marchantia* we can easily observe a proper well-developed gamophyllous involucre; and most of them possess a peculiar organ (colesula) wanting in analogy to the perichætium of *Bryineæ*. They are never synœcious, but, for the most, diœcious.

Besides these characters, we may consider the matter a little more completely. The germination of the *Hepaticæ* is very polymorphous; in *Marchantiaceæ*, *Jungermanniaceæ frondosæ*, and *Anthocerotaceæ* the protonema (*i. e.* the protonema of all the frondose Liverworts) is very short, nearly globular and bulbiform, and comparatively very little differentiated from the young spore plant—in *Frullania*, *Radula*, and others a cellular disk, developing the new individual—in *Jungermanniaceæ foliosæ* with round and entire leaves, a little more elongate, thick, and seldom branched—but in *J. foliosæ* with lobed leaves, rather long, narrow, and branched, nearly

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* The narrow base (stipes) of the shoots of *Hymenophyton flabellatum* is upright, undivided and somewhat flat, with a central fibrovascular fascicle, which is broad and much flattened, like a ribbon, as in most of the ferns. In a transverse section the fascicle is seen to be formed in the middle by three or four layers of cells, but at the ends by four or six layers. It is well defined and easily separated from the parenchyma of the stem; for we have only to seize it with the forceps and draw it out from its connexion with the latter tissue, just as we can do in the softer parts of the ferns; and its cells are, in the transverse section, very small, distinctly incrassate, and of a light-brown colour. The cells are very long and narrow, with acute ends, and are thus very like bast-cells, though the ends are not so long and acute as is usually the case with the latter when normally developed. They show, too, extremely dense and fine spiral incrassations, and mostly break up when they are isolated (and especially towards their ends) into beautiful, broad, spiral bands. The central, but terete fascicle in *Pallavacinia Lyellii* is constructed nearly in the same way.

as in the *Bryineæ*: in these latter, however, the protonema* nurse produces several new plants and is much more branched. The stem is narrow, terete, and normally foliate, or broad, flattened, and bearing leaves on its underside, in the former sometimes covered with a layer, or layers, of larger cells of epidermis not unlike what is seen in *Sphagnaceæ*, in the latter very often showing within many large air-holes and numerous stomata in its upperside. The leaves are most multiform, and of more diverse kinds than in *Bryineæ*, as nearly all Liverworts bear true vegetative leaves, amphigastria, bracts, and colesulæ; they are fixed on the stem longitudinally or transversely with all possible intermediate angles of adhesion; sometimes they are alternate, sometimes opposite and connate with each other and with the interjacent amphigastrium; in form both they and the amphigastria are most variable, from reniform, or round and entire, to penicilliform, and dissect in fine thread-like segments; moreover the leaves are often furnished with one or several ventral lobes, subulate to pouch-like; these are formed by only one layer of cells, and want all trace of the nerve of mosses †. What has been said about the leaves is also applicable to the female and male bracts. The pistillidia (archegonia) are fixed on the top of a usually very short branch growing out from the axil of an amphigastrium, or on the top of the stem itself and of the secondary or tertiary branches (innovations) from axils of true vegetative leaves. As far as I know, no paraphyses have been found in the female inflorescence, except in some thalamomitrious forms. The fruit is enveloped by a proper pouch as long as it is unripe, after maturity the seta begins to grow out and becomes elongated; the covering pouch is formed by the cellular tissue around the original central cell (*calyptra gynomitriea*), or by the excavate receptacle of the female inflorescence (*c. thalamomitriea*). The inside of the fruit, when its wall is cleft into valves, shows beautiful annular cells; the valves are usually four, straight, or seldom twisted, but sometimes only one (*Monoclea*), or two (*Anthocerotaceæ*), or more than four, as in some *Jung. frondosæ*, or more irregular, only in a few *Marchantiaceæ* circumscissile, with a lid; or the fruit is an indehiscent nut-like theca (*Riccieæ* and *Sphærocarpeæ*); only in *Anthocerotaceæ* do we find a columella and stomata on the outside of the valves. The spores are mingled with elaters, and their cuticula more highly developed than in *Bryineæ*, being often covered by beautiful ridges, tubercles, prickles, &c., especially in the frondose forms. Antheridia are situated in flat heads formed of the receptacle, in which they are completely immersed, or in rows along the median line of the frond, or in long spikes, or in the axils of the female bracts (*inflor. paroica*); they vary from cylindric-oblong to quite globular, often long-stipitate, and mostly without paraphyses, which, when they are present, are very often broad and leaf-like.

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* The prothallium of ferns is, in physiological respects, an organ widely different from the protonema of Livermosses and Mosses, and it may, from bearing the organs of generation, be called *gamothallium*.

† In the base of the leaves of *Nardia revoluta*, from Dovrefjeld, in Norway, I have observed that the cells in the middle are arranged in *two* layers. The obscure nerve in the leaves of *Diplophyllum albicans* is formed by only one layer of cells, just as the nerve in the female bracts of *Hypopterygium japonicum*.

In fact the Liverworts seem in their relation to the Mosses to remind us a little of the Dicotyledonous plants in their relation to *Monocotyledoneæ*, because they grow chiefly in countries between the tropics, they form no moss-meadows, they are succulent and fragile and contain ethereal oils * and several (yellow) colouring-matters, their organs are very polymorphous as to form and development, they are, with respect to the stem and leaves, normally formed or frondose, and embrace both the highest (*Marchantia*) and the lowest (*Riccia, Sphærocarpus, Notothylas*) of all *Muscineæ*; their leaves are not unfrequently opposite and connate. Some of the frondose species, as *Aneuræ*, approach in habit, form, and structure a little to *Podostemaceæ*, one of the lowest orders among *Dicotyledoneæ*.

The first and best-developed family of *Hepaticæ* is, I think *Marchantiaceæ*, with its highest type *M. polymorpha.* They all possess two different forms of root-cells, of which the one kind with clavulate incrassations † is in them very characteristic. The stem is peculiarly constructed of large and numerous air-cavities, with stomata in the roof and containing copious ramified Opuntia-like cell-series from their bottom. The leaves are of many different kinds, namely:—true vegetative leaves and amphigastria on the underside of the flattened frondose stem, for the most part of deep purple colour, in some others more hyaline at the insertion of the common peduncle to the frond and at the upper attachment of the same to the receptacle; the genus *Marchantia* has moreover on the underside of the infructescence several large gamophyllous involucra, each of which surrounds several pistillidia, which are all covered by their own colesula. They are also furnished with the best-developed spores, showing ridges &c. in their cuticula, and elaters, sometimes exhibiting five spiral threads. Their male organs are the longest of all and immersed in peculiar disks, like the flattened heads of some *Dorsteniæ*, and sometimes stipitate as the female compound inflorescence. Some of them, as *M. polymorpha*, are adorned by spiral cells of no less than four different kinds—the already described cells with clavate incrassations, reticulate cells in the frond, and in the theca both annular and true spiral cells. Nearest to them come the *Jungermanniaceæ frondosæ*, by their pretty distinct transition in germination, leaves, andrœcium (*Aneura*, confer *Targionia*) and habit to *Marchantiaceæ*, as also by their sometimes beautiful and distinct fibro-vascular fascicle and highly organized spores (*Pellia*). Of them all, *Pallavacinia* may stand as the first genus, on account of its gamophyllous involucre and colesula being both present at the same time. *Lepidolæna* is to be placed in the front of *Jung. foliosæ thalamomitrieæ*, as also *Frullania* of *J. fol. gynomitrieæ*, according to their particularly well-developed leaves and amphigastria. A proper section of *Jungermaniaceæ* is *Sphærocarpeæ*, composed of the genus *Sphærocarpus*, which in habit and structure of frond approaches to *Notothylas* in the following family. *Anthocerotaceæ* must, I think, be placed at the end of *Hepaticæ*, because their oogonium (embryo-sac, central cell) is naked, and their frond and elaters show a very low grade of development, although they possess a columella and stomata on the outside of the theca, which two organs are very characteristic, and are vainly to be searched for in the other families of Liverworts.

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* These ethereal oils are deposited in the peculiar bodies called by Germans *Zellenbläschen*. In *Porella lævigata* I have, by distillation with pure water, isolated the ethereal oil, here a stearoptene near to camphor.

† These singular cells are called *root-cells*; but they are present also on the common peduncle and on the receptacle of the carpocephalum. I do not understand their physiological function, though with roots they have, I think, nothing to do.

The Mosses are superior to the *Hepaticæ* only in regard to the more composite structure of their theca and the presence of a nerve in their leaf; but in all other respects they seem to be in-inferior.

From a spore originate several young plants. The protonema is long and densely branched, and is always composed of single rows of cells; but in *Georgia pellucida* there grow out from these nurse threads spathulate proembryons, from the narrow base of which the new individuals are developed. In *Andreæa* we often see the spore give rise to a cellular mass from which the usual protonema originates; and in *Sphagnaceæ* the product of the germination of the spore is a frondose laciniate proembryo formed by a single layer of cells, which strongly reminds us of the sterile frond of some Liverworts, as of *Aneura palmata* or *Anthoceros punctatus*. Their stem is never frondose, and wants all fibro-vascular fascicles, but instead sometimes possesses an axile fascicle of cambiiform cells, or even several such (but spread out and not axile) in the stem of *Polytrichum commune*; the stem of *Sphagnaceæ* is covered by a proper integument of exoepidermoidal cells in one or several layers, all large, empty, many of them perforated, but seldom showing spiral incrassations; their branches are also fascicled, which we vainly search for in other Mosses. In the true Leaf-mosses (*Musci*) we find no spiral incrassations in the cells, except in the teeth of *Hymenodon pilifer* and *Fissidens ventricosus*, and in the base of the leaves and female bracts of *Heliconema Sprucei* *. The leaves are only of three different kinds, viz. true vegetative leaves and bracts in all—but only in a few species *folia mediana*, now on the dorsal, now on the ventral side of the stem, in none so distinct as in *Helicophyllum torquatum* †, where they totally differ from the true leaves both in form and structure, but are very like the female bracts. The leaves are fixed transversely on the stem; only in *Schistostega* and *Mittenia* ‡ we find them vertical on the sterile innovations; they are always alternate, never opposite or connate, and entire, except in some *Fabroniæ* and *Splachnaceæ*, especially in *Tayloria laciniata*, in which there is a distinct approach to laciniation: in no form is there present a ventral lobe. Not unfrequently the leaf is composed of several layers of cells, especially the nerve, which is always constructed of more than one layer. The bracts agree perfectly with the leaves in their common characters; and we never find a trace of an involucre or a colesula. The pistillidia are situated in heads (*not flowers*!) on the top of the stem or in vegetative axils, surrounded by bracts, and in most also by paraphyses, which only in *Sphagnaceæ* are branched, but in all are constructed of single cell-rows. The calyptra of the fruit is always generated from the enlarged cellular cover around the central cell, which by the augmentation of the young fruit is torn off from its lowest part, the latter without any limit passing into the receptacle of the inflorescence, and now with it forming the vaginula; this veil always covers the top of the seta (*i. e.* the increasing young fruit), which seta ripens from below earlier than the theca. This latter is a *capsula circumscissa valvulis dehiscens vel clausa*, usually with a ring and a double or a single row of teeth in the orifice, and possesses in its lower part numerous stomata *, superficial or immersed. In the axis of the theca we find a columella at the top coherent to the lid, except in *Sphagnaceæ* which have the sporal sac lying over the columella and separating this central pillar from the operculum. The spores are always composed of only a single cell, and in most smooth, seldom covered by small tubercles or prickles, and never mingled with any elaters. The antheridia are nearly always elongate; but in *Buxbaumia* and *Sphagnum* they are globular and surrounded by paraphyses; they are also situated in heads on the top or in the vegetative axils of the stem, sometimes in the axils of the female bracts, or mixed with the pistillidia in the same perichætium (*inflorescentia synoica*).

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* The thin, pellucid, and, in the lower end, perforated cells in the leaves and female bracts of *Heliconema Sprucei* show uncommonly broad, very thin, and, at their edges, most indistinctly effigurate annular incrassations, which fill up nearly the whole cell, and are of a very light green-brown colour. The cells, when old, very often fall into annular pieces.

† This solitary plant is placed by Dr. C. Müller among the pleurocarpous mosses—a most unnatural arrangement. It is, no doubt, a link of *Grimmiales* nearest to *Schlotheimia*, and not at all a pleurocarpous form, but rather cladocarpous, as many of the acrocarpous are.

‡ *Mittenia*, Lindb. in Öfv. V.-Akad. Förh. xix. p. 606, n. 5 (1862) is the same as *Mniopsis*, Mitt. in Hook. f. Fl. Tasm. ii. p. 187, t. 173. n. 7 (1858); but M. Dumortier has already, in his Comment. Bot. p. 114 (1823), called the *Jungermannia Hookeri* of Lyell, in Engl. Bot. xxxvi. t. 2555 (1813) *Mniopsis Hookeri* (*Haplomitrium*, N. Es. 1833).

The Mosses grow most abundantly in the temperate and colder regions of the world, where they often form extensive moss-meadows; they are more or less rigid and tenacious, and contain no ethereal oils, and seldom a trace of colouring-matters; they are much more uniform than the Liverworts and never frondose †; their leaves are never opposite or connate. Both in these characters and in habit, rigidity, &c., they remind us of some monocotyledonous plants; *e. g. Polytrichum, Dawsonia*, &c., bear in their general appearance a great resemblance to some *Dianellæ, Cordylinæ, Dracænæ*, and *Yuccæ*, or to some *Bromeliaceæ*.

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* But in *Sphagna* and *Mnium Maximoviczii*, Lindb., a new and most interesting species from Japan, the stomata are spread out over the whole surface of the theca.

† Only in *Andreææ* the first roots are sometimes flattened and frondose, if we may be allowed to use this term here.

The transition group up towards Liverworts is *Sphagnaceæ*, which are distinct from *Musci veri* by the prothallium, the absence of roots on the full-grown plant, the structure of the stem, the fascicled branches, the difference between the stem- and branch-leaves, all composed of two different kinds of cells, the long-stipitate and globular antheridia situated in long catkins, the branched paraphyses, the half-globular sporal sac separating the columella from the lid, the dimorphous spores (but I must confess that I have never been able to find more than one form!), and by the never synoicous inflorescence. And in fact this order approaches to *Hepaticæ* by the structure of the stem, the elongate male catkins, and the form of the antheridia, the absence of a ring, as also by the incrassate cuticula of the spores. Among *Bryineæ* the Peatmosses seem to have a somewhat analogous place to that of the *Coniferæ* among the seed-plants, by their habitat especially in the colder regions (where they grow in enormous masses and form extensive moss-woods fit for fuel), living best many together, the straight simple stem increasing at the top, the branches fascicled as the leaves are in many Conifers, and by copious pores piercing their whole texture.

The latter alliance (*Musci*) of *Bryineæ* may perhaps be divided in the usual way into *Acrocarpi* and *Pleurocarpi*.

Of all Mosses, I think *Polytrichaceæ* are the highest, according to the following important characters. They are nearly all diœcious; the habit reminds us very much of some *Liliaceæ*; the stem, as in *Polytrichum commune*, shows well-developed diffused fascicles of cambiiform cells; the leaves have a long vaginate base and a long lamina, on the upperside covered by copious vertical lamellæ enclosing chlorophyl; the nerve is the most complicated and highest-developed of all, as also they possess the best-evolved fruit and peristomium with its appendages, the peculiarly hairy calyptra; their antheridia are the largest of all, with the paraphyses distinctly passing into male bracts; the andrœcium is in the middle perforated by a new male branch, and so repeatedly every year, or, much more seldom, by a female branch. The *Andreæaceæ* I must consider the lowest group of *Grimmiales* (by some very few characters pointing to the Liverworts), and perhaps also the lowest of all forms composing the *Musci acrocarpi*.

Pleurocarpi, on the contrary, are much more uniform than the *Acrocarpi* both as to the vegetative and to the fructificative system. Besides that, they show neither such high forms as *Polytricha*, nor such lowly developed ones as *Andreææ*. The nerve also, that very characteristic organ in the leaf of the *Musci*, is always of the same low internal organization. More difficult than in *Acrocarpi* is it to decide which of their links may take the first place. This place of honour, must, I think, be adjudged to *Thyidium*, ex. gr. *Th. tamariscifolium**, according to its strongly ramified stem, bearing numerous paraphylla, and divided into several *étages* of years: its leaves are of different forms, in relation to their place either on the stem itself or on its primary or secondary branches; all the leaves are constructed of strongly incrassate and papillose cells; but the bracts of the perichætium are quite unlike the leaves both in their form and in their areolation and glossiness; the theca is also often unusually large†.

A very remarkable fact is, that in most of the groups of Liverworts and Mosses the highest form is cosmopolitan, or at least widely diffused. In proof may be mentioned that among *Marchantiaceæ* the *M. polymorpha* and, in antarctic countries, *M. tabularis*, perhaps only a subspecies of the former, are the commonest of all; of *Jungermanniaceæ foliosæ gynomitrieæ*, *Frullania dilatata* and *tamarisci*—and of *J. foliosæ thalamomitrieæ*, *Lepidolæna magalhanica* and *Trichocolea tomentella* are rather common; *Anthoceros lævis* may with justice be called a cosmopolite. *Sphagnum palustre* has, with its subspecies, the widest diffusion of all species; in the same relation are, for instance, *Polytrichum commune* and *juniperinum*, *Tortula ruralis*, *Funaria hygrometrica*, *Bryum roseum* (and its subspecies), *Mnium undulatum* and *rostratum*, *Gymnocybe palustris*, *Rhacomitrium hypnoides*, *Thyidium tamarisci-folium*, *Stereodon cupressiformis*, &c. The same law we find also in many genera. Is it because all these best-developed forms have the strongest vital power, and are thus best armed in the struggle for life?

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* *Hypnum tamariscifolium*, Neck. Meth. Musc. p. 158. n. 9 (1771), = *H. tamariscinum*, Hedw. Sp. Musc. p. 261 (1801).

† A common law in the Mosses is, that, when the theca is regular and upright, the peristome is less developed, very often that of a *Leskea*, or the inner one wanting; but when the theca is irregular and cernuous, the peristome is more highly developed, very often that of a *Hypnum*,—thus in *Funaria*, most pleurocarpous forms, &c.; and not unfrequently both forms occur in the same species, as in *Plagiothecium denticulatum* and *silvaticum*.

On the Development of the Andrœcium in *Cochliostema*, Lem.

By M. T. MASTERS, M.D., F.R.S., F.L.S., &c.

[Read March 7, 1872.]

[PLATE IV.]

IN the 'Gardeners' Chronicle' for 1868, pp. 264, 323, I had occasion to describe that most remarkable and beautiful plant *Cochliostema Jacobianum*, Lem., and to give the history of its introduction into this country. At that time I was only enabled to examine adult flowers, and, with some imprudence it must be confessed, I hazarded a theory as to the peculiarities of the staminal apparatus. I have since studied the course of development of the flower in question; and, as a result, I find that while my description of the adult flower was in the main accurate, my theoretical explanation of its peculiarities was in many respects erroneous. It is with the view of correcting these errors and inducing others to investigate the peculiarly remarkable structure of this splendid plant, that I now beg to lay before the Society the following particulars as to the development of the flower, and especially of the andrœcium.

The flower first appears in the form of a globular tubercle (Pl. IV. fig. 1), on one side of which shortly appears a thick semilunar prominence, which is the origin of the posterior sepal (fig. 2). The two remaining sepals are formed in succession, one after the other (fig. 3). I have never absolutely seen the flower with two sepals only; but, from the small relative size of one of the three sepals (that placed next the bract) and from analogy with other flowers, I have no doubt that the three sepals are formed in succession. If the three sepals be turned back with the dissecting-needle, as shown in fig. 4, the central growing point may be seen to have lost its globular form, to have assumed a triangular outline, and to be somewhat depressed at the top.

From the three corners of the central growing point protrude simultaneously the three petals (fig. 5), which only precede the appearance of the stamens by a very short interval—so short, indeed, that one may examine a great many flowers before finding one in which the petals alone are formed without indications of the stamens. At this period the superiority in relative size of the posterior and first-formed sepal is very marked.

As to the andrœcium, it is perfectly clear that this consists of six elements; and all analogy would suggest that these six portions should be in two rows, one within the other, the innermost developed subsequently to the outer. I cannot assert positively that this is not so; all that I can say is, that after examining several flowers I have never been able to see that the andrœcium follows this course. It has always appeared to me that the three posterior stamens are developed at about the same period and in advance of the three anterior ones (figs. 6, 8, 9); at any rate, shortly after the petals have manifested themselves, the andrœcium may be seen to consist of three tubercles at the back of the flower, all three of about equal size, and of three anterior tubercles much smaller than the posterior ones, and of unequal size, the central one being much smaller than the other two (figs. 8, 9). The position of the staminal tubercles is as follows: the odd posterior stamen is opposite the first-formed sepal; the two postero-lateral staminal tubercles are opposed to two corresponding petals. Of the three tubercles in the anterior part of the flower, the two lateral are opposite the sepals, the central one is opposite the anterior petal. The arrangement, then, of the stamens is quite consistent with their disposition in two rows formed one after the other, though, as before stated, I have not been able to satisfy myself that, in point of time, there is any such regularity of appearance. Following the course of the andrœcium from this point, it will be seen that the superior size of the three posterior staminal tubercles is maintained, that they become notched at the summit (figs. 10, 11), and speedily present traces of anthers. The three anterior tubercles, on the other hand, progress very slowly, and never form anthers at their summits (fig. 12). It is now evident that the two antero-lateral tubercles are the lateral "staminodes" of the adult flower. The central tubercle is the least developed of the three; in fact it often ceases to grow, so that in the adult flower it frequently happens that it is overlooked, or that it is really absent. Up to this time the six staminal tubercles have been distinct; but now, by the further growth of the entire andrœcium at the base, a shallow tube is formed, the margin of which bears the stamens and staminodes as just described. Owing to the relatively increased growth on the posterior side of the flower as compared with that on the anterior half, the staminal tube is much deeper on the former (fig. 13) than on the latter side (fig. 12); and it retains this inequality to a very marked degree in the adult flower, where. indeed, the three posterior stamens may be seen always inseparate for nearly half their length, while the two antero-lateral staminodes are quite detached. The anther, in the early stages of its existence, is an ordinary two-lobed structure (fig. 12), each lobe being again subdivided into two minor lobules by a slight depression. There is at first no trace of the spiral curvature which afterwards becomes so remarkable a feature of these plants. The connective in the odd posterior stamen remains horizontal, whilst in the two postero-lateral anthers it assumes gradually a vertical position. The direction of growth of the anther, as of the coil, is centrifugal, *i. e.* from the centre outwards and upwards (fig. 14). Not till after the anthers begin to manifest the spiral coil is there any indication of those petal-like hoods which conceal the anthers in the adult flower, of which they constitute so remarkable a feature. The course of development shows them to be mere petaloid outgrowths from the sides of each of the postero-lateral filaments, gradually increasing till they completely envelope the anthers (fig. 15). During this process the anther of the posterior central stamen, which heretofore had maintained its proper position, becomes, as it were, pressed to the front in advance of the two lateral anthers, and thus in the adult flower may give rise to the false impression that it is really and organically interior (figs. 16, 17), an impression I myself had when I first described the structure of the flower. Not till the stamens have assumed the characters and positions just mentioned is there any indication whatever of that curiously lobed and ciliated process which I formerly regarded as a staminode belonging to an outer series of abortive stamens. It is, despite its position and prominence in the adult flower, a mere outgrowth from the thalamus, at the back of the flower (fig. 18). What, if any, morphological significance, or what physiological office it may have, is at present unknown. It may be connected in some way with the process of fertilization; but this is a mere guess.

The development of the pistil presents nothing noteworthy or different from what occurs in many other Endogenous flowers. Its three component carpels are formed simultaneously—one posterior, two antero-lateral. They make their appearance soon after the formation of the staminal tubercles, and before any indication of anthers is present (fig. 8). The carpels are closed, and the style formed, before the occurrence of those remarkable changes in the stamens already allued to.

It is only after repeated examinations that I venture to lay before the Society the results of my observations on the development of this remarkable flower. I have the more hesitation in doing so, as the course of development in the andrœcium is so different from that described by Payer in *Tradescantia* or *Commelyna**. For the sake of comparison I add a brief abstract of the conclusions arrived at by the eminent French *savant*. Payer describes the sepals as developed in succession, the latest being the anterior one or that superposed to the "*bractée mère*;" the petals are described as simultaneous in their appearance—one placed internally, one externally, and one, half internally, half externally. So far my observations are quite in accordance with those of Payer; but in the case of the andrœcium there are material discrepancies, as will be obvious from a comparison of what has been previously stated with Payer's account of the development of the stamens in the regular-flowered *Tradescantia*. The andrœcium, according to this botanist, consists of six stamens in two rows: the stamens of each whorl appear all at the same time; but the members of the inner series, those superposed to the petals, appear first, before those placed in front of the sepals, a wholly exceptional occurrence. It is unnecessary to say more as to the development of the other parts of the flower, or as to the inflorescence, as my observations on these points coincide with those of Payer. I may, however, indicate that although *Cochliostema* in the adult state is, by reason of its structure, far removed from other genera of the same family, yet there are points in its conformation which appear to connect it with other genera of the same family. For instance, in *Commelyna* itself, of the six stamens the three posterior only are fertile, *i. e.* one of the outer row and two of the inner, exactly as in *Cochliostema*. In some species of *Aneleima* on the other hand, as also in *Dichæspermum*, the three outer stamens, placed in front of the sepals, are fertile, the three inner ones being sterile. *Dithyrocarpus* has all six stamens fertile. The hairs on the filaments of Tradescantias and Commelynas may probably be looked on as having some relation to the way in which the flower gets fertilized; but whether they have the same office as the petal-like hoods of *Cochliostema* is a matter of doubt. Again, the peculiarly dilated connective of many Tradescantias is clearly analogous to the expanded filament of the plant under consideration.

In conclusion, then, it would appear from what has been above stated, that the andrœcium of *Cochliostema* does not differ in the number and position of its parts from that of other genera of the same Order. It does differ in the order and manner in which the six elements are developed, in the congenital want of separation (union) of one of the outer and two of the inner series of stamens, in the spirally twisted anthers, in the petaloid outgrowth from the filaments, and in the development at the back of the flower of that peculiar tuft of hairs which in the adult flower seems to form one of three staminodes, but which the course of development shows to be an acquired structure, long posterior to the true staminodes in its development.

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* Payer, 'Organogénie,' p. 663, t. 140.

It may be inferred from this that the primitive or congenital number and arrangement of parts (in this case six in two rows—one in front of the sepals, one in front of the petals) is a fact of more weight than congenital irregularity or congenital union (want of separation), and that the acquired or adaptive characters (*i. e.* the spiral anthers, the petal-like hoods, and the posterior tuft of hairs) are, from a morphological point of view, altogether of secondary importance, greatly as they affect the external appearance of the flower in the adult state, and important as they are in all probability with reference to the physiological history of the flower.

If these remarks and the observations on which they are founded be correct, they offer a striking confirmation of the difference between, and the relative value of congenital and acquired characters, as further explained in my work on 'Vegetable Teratology,' and in a paper on the "Conformation of Passifloraceæ" recently published in the Society's 'Transactions.'

EXPLANATION OF THE FIGURES.

Fig. 1. Earliest stage of flower.
2. Shows the floral tubercle, with the rudiment of the posterior sepal, *s*.
3. All three sepals formed (*s*, *s*, *s*), the posterior one the largest.
4. Posterior sepal turned back and the antero-lateral ones turned aside, to show the floral tubercle now triangular in outline.
5. Sepals turned back as before, to show the three petals (*p*, *p*, *p*) simultaneously developed.
6. Section lengthwise through a young flower, showing the large posterior sepal, two antero-lateral sepals cut through, and, in the centre, indications of the carpellary tubercles.
7. Side view of the same bud.
8. Bud, in which a portion only of the posterior sepal is shown: the petals are flattened; all six stamens are now visible, three posterior ones large,

three others smaller; in the centre are the three carpellary tubercles as yet unclosed.

9. Andrœcium of the same bud as 8, more highly magnified and seen from the back.
10. Andrœcium from a flower more fully advanced than 9, and showing the three larger and three smaller stamens surrounding the pistil.
11. Back of the andrœcium from the same flower as 10: *p, p,* the petals.
12. Andrœcium and gynæcium still further developed; the anthers are now well developed.
13. Andrœcium from the same flower as fig. 12, seen from the back.
14. Anthers beginning to show the spiral twist.
15. Andrœcium and pistil completed.
16. Posterior view of the same.
17. Andrœcium complete from another flower; parts forced open.
18. Andrœcium from the back showing traces of the posterior staminode (?) at ×.
19. Diagram of the flower.

In the preceding figures *s* stands for the sepals, *p* for the petals; *o* indicates the position of the axis, × the situation of the posterior appendage, and I the actual size of the organ by the side of which it is placed.

Revision of the Genera and Species of Scilleæ and Chlorogaleæ.

By J. G. Baker, Esq., F.L.S.

[Read March 7, 1872.]

The present paper may be regarded as a continuation of the revision of the genera and species of Liliaceæ, the first part of which I had the honour of submitting to the Society two years ago, and which was printed in the eleventh volume of the 'Proceedings,' pp. 349 to 436. In that part I dealt with the whole of the gamophyllous capsular section of the order, exclusive of the tribe Aloineæ. I am not prepared to suggest any better plan of classifying the capsular Liliaceæ than to arrange them, in the first place, in two series—one characterized by a perianth with the divisions more or less completely united, and the other in which they are free down to the base. If we adopt this plan and take for the diagnostics of tribes the characters furnished by the nature of the rootstock and plan of arrangement of the inflorescence, regarding a material difference in either of these two points as of sufficient importance to constitute a distinct tribe, our tribes in the two series will run, to a large extent, parallel with one another, there being pretty much the same range of variation in inflorescence and rootstock in the gamophyllous and polyphyllous groups. Without entering into details, I give now merely a Table showing the planning-out of the tribes according to this idea and their parallelism under the two series.

Rootstock bulbous.	*Perianth gamophyllous.*	*Perianth polyphyllous.*
Inflorescence racemose.	Hyacintheæ and Massonieæ.	Scilleæ and Tulipeeæ.
" paniculate.	Odontostemoneæ.	Chlorogaleæ.
" umbellate.	Milleæ.	Allieæ.
Rootstock tuberous or fibrous.		
Herbaceæ.		
Inflorescence racemose or paniculate.	Hemerocallideæ.	Anthericeæ and Eriospermeæ.
Inflorescence umbellate.	Agapantheæ.	Aphyllantheæ.
Suffructicoso-carnosæ.	Aloineæ.	Yuccoideæ.

The polyphyllous series is represented much more numerously than the gamophyllous one, perhaps not by generic, but conspicuously by specific types; and in the present paper I have dealt only with the genera and species of the first two polyphyllous tribes, Scilleæ and Chlorogaleæ—the latter, like its gamophyllous representative Odontostemoneæ, represented very scantily, but the former, Scilleæ, containing nearly as many species as the whole of the tribes of the gamophyllous series, exclusive of Aloineæ, put together.

In the way of general remarks, preliminary to the technical definitions of genera and species, I have exceedingly little to say. Scilleæ may be fairly taken as representing the endogenous type of structure in its most typical and symmetrical development; and *Scilla* and *Ornithogalum* are plants so familiar to every one that it is quite needless to enlarge upon them. I shall therefore only pass the different organs briefly in review, and say a few words upon the modifications which they furnish to characterize genera and groups of species.

Bulb.—There is no material difference in the bulbs of all the plants here included. All are proper typical bulbs of the tunicated kind. Two of them are of officinal interest, the Squill and the Californian Soap-plant.

Leaves.—The leaves are usually contemporaneous with the flowers; but they are developed more or less decidedly after them in several species, as in our British *Scilla autumnalis*, and still more distinctly in several of the Urgineas. In *Bowiea*, a curious monotypic Cape genus with a wide-climbing habit, there are only a pair of small fleshy linear leaves, which vanish very early.

Usually the leaves are fleshy in texture and die down soon after the flowers fade; but in a few Ornithogalums and Urgineas and in *Chlorogalum* and *Nolina* they are firmer and more durable. In shape they are mostly linear or lorate, more or less decidedly channelled down the face. In a few species of *Scilla* and *Drimiopsis* they are dilated out into a broad blade with a distinct channelled petiole; and in several species they are subterete or filiform. *Ornithogalum unifolium* and *anomalum* and *Scilla monophylla* have normally only a single leaf to a stem; several species, of which *Scilla bifolia* is a familiar example, have a pair; but the ordinary number is from half a dozen to a dozen.

Stem.—The stem is quite naked in all the genera except *Nolina* and *Chlorogalum*, in which it has merely a few bract-like much reduced leaves below the panicles.

Inflorescence.—Throughout the majority of the Scilleæ the inflorescence scarcely varies from a typical raceme. In two of the groups of *Ornithogalum* it becomes decidedly corymbose; and in *Drimiopsis* it is almost condensed into a spike. The dichotomously forked sterile branchlets of *Bowiea* are very curious and unique. In *Chlorogalum* and *Nolina* we have a panicle with a few laxly racemose branches, just that which is common in the *Anthericeæ*, to which these two genera also approximate by having their pedicels distinctly articulated at the apex.

Bracts.—The bracts are very rarely obsolete, and often furnish good characters to distinguish closely allied species or groups. In *Scilla*, for instance, we have species with minute deltoid or prominent linear or lanceolate solitary bracts—and in a few species a pair to each pedicel, one large and the other much smaller. In *Urginea* the bracts are mostly distinctly spurred—in some species at the base, and in others some distance above it. In *Whiteheadia* each flower is subtended by a large, cordate, amplexicaul, greenish, membranous bract, which quite enwraps it. In *Eucomis* the raceme is crowned by a rosette of twenty or thirty flowerless bracts of leaf-like texture.

Perianth.—It is from the divisions of the perianth that we get the best characters for genera and groups. The calycine and corolline three are decidedly dissimilar only in *Albuca*, in which the three inner ones are distinctly incurved and furnished with a pubescent callus at the point, and are wrapped down permanently over the stamens and stigmas. In many groups, especially in *Drimiopsis* and *Scilla*, section *Ledebouria*, one or both sets of segments are distinctly incurved at the point, or even along the sides. In colour and nervation there is a wide range in the two tribes, and within the bounds of each of three larger genera, *Scilla*, *Ornithogalum*, and *Urginea*. For instance, in *Ornithogalum* we may trace at least three distinct types:—the first, represented by *arabicum*, in which the colouring is uniform and the veining altogether fan-like and inconspicuous; the second, represented by *umbellatum*, in which there is a broad, laxly many-nerved dash of green down the back, which leaves only a narrow rim of white down each edge; and the third type, represented by *narbonense*, in which there is only a distinct narrow band of green down the keel on the back, which contains three or four closely crowded parallel more or less decidedly anastomosing nerves. In *Scilla* there is always a narrow single-nerved keel; but there is great difference in colour and in the manner in which the divisions spread in the fully expanded flower. In this latter point our three English species, *verna* and *autumnalis* on one side, and our common wild Hyacinth on the other, represent the extremes. In *Urginea* there are two well-marked groups—one characterized by narrow-keeled one-nerved segments, like *Scilla*, and the other by broad-keeled many-nerved segments, like *Ornithogalum umbellatum* or *Albuca*.

Stamens.—The position of the stamens furnishes great help in characterizing the genera of Scilleæ; but in the great majority of the genera I have called perigynous they are placed very near the base of the divisions. Only in the *Agraphis* section of *Scilla* are they decidedly biserial and unequal. Of the other perigynous genera or groups, they are placed a little above the base in *Eucomis*, *Whiteheadia*, and *Scilla*, section *Ledebouria*. In *Ornithogalum* there are sometimes curious differences between the alternate filaments. Sometimes the alternate ones, and occasionally all the six, are dilated aud petaloid at the base or even throughout, with three cusps, the central cusp bearing the anther, as in the section *Porrum* of *Allium*. Usually the filaments are only a little shorter than the perianth, the only conspicuous exception to this being in *Drimiopsis*. Often the stamens are slightly declinate. The six filaments are always fully developed; but in one section of *Albuca* the alternate anthers are commonly abortive. I have not observed any noteworthy variation in the dehiscence of the anthers or in the way they are fixed upon the filaments.

Ovary and Capsule.—In only one instance in the two tribes, *Nolina*, a monotypic Georgian genus, is the dehiscence of the capsule other than loculicidal. In the shape of the capsule and its large flattened uniseriate seeds, *Urginea* differs conspicuously from all the other genera, thus occupying in Scilleæ a position quite analogous to *Dipcadi* in Hyacintheæ, which has similar seeds and capsules. The ovules are usually several and superposed in each of three cells; but they are often geminate and collateral, and casually even solitary. In *Scilla* we get all these three variations represented. In *Scilla* also the difference between sessile and stipitate capsules affords useful characters. There is a considerable range of variation in the style, which is usually distinct and cylindrical. Only in two of the sections of *Albuca* are the three stigmata distinctly separated.

Sources consulted.—The sources used as a foundation for this paper are substantially the same as those employed for my last, of which an account will be found at p. 351 of the eleventh volume of our 'Proceedings.' The explorations in the interior of the Cape district by Mr. Cooper, under the auspices of our Vice-President, Mr. Wilson Saunders, have resulted in the discovery of a large number of new species of the genus *Scilla*, section *Ledebouria*, many of which have been figured in the 'Refugium.' Of this section we know now nearly forty species against seven in 1843, the date of the fourth volume of Kunth's 'Enumeratio.' My best thanks are due to Dr. Ahlberg and Professor Areschoug, of Upsala, for their kindness in lending as many of the type specimens of Thunberg's Cape species as I required, which have been most useful in clearing up many doubtful points of nomenclature in Scilleæ and still more in Anthericeæ.

Geographical Distribution.—Of the 201 species which are described under the two tribes here treated, 198 belong to Scilleæ, and only 3 to Chlorogaleæ. Of the large genera, *Scilla*, as here defined, with 72 species, is confined to the Old World—32 species being confined to the Cape, and the others spread widely through Europe and the Mediterranean region, with a few in Tropical Africa, and outlying species reaching Hindostan, China, and Japan. Out of the 73 species of *Ornithogalum*, 39 belong to the Cape. Of its 7 subgenera, two are exclusively European and Oriental, two are exclusively Cape, and the other three mainly Cape. A few species are Tropical-African, one only Peruvian and Chilian, none East-Indian or East-Asiatic. *Urginea*, with 24 species, is spread through the whole of Africa, reaching Hindostan and South Europe. Of the smaller genera, *Eucomis*, *White-*

headia, and *Bowiea* are exclusively Cape; *Albuca* and *Drimiopsis* principally Cape, with outlying representatives in Tropical Africa; and *Chlorogalum*, *Camassia*, with two species each, and *Nolina*, which is monotypic, exclusively North-American. Comparing the Cape with the rest of the world, here, as in the gamophyllous tribes already treated, about 50 per cent. of the whole number of species, 102 species out of 201, belong exclusively to the Cape flora. Comparing the Old World with the New, we have 195 species against 6. Comparing the western with the eastern half of the Old World, Europe, the Orient, and Africa against Central and Eastern Asia, Australia, and Polynesia, we get 191 species against 4, 2 of which are Indian, 1 Chinese, and 1 Japanese, none East-Siberian, Australian, or Polynesian.

CLAVIS TRIBUUM ET GENERUM.

Series 2. *Perianthium segmentis liberis vel ima basi solum leviter connatis.*

Tribus 7. SCILLEÆ. Herbæ bulbosæ, pedunculis nudis, floribus racemosis.

* *Stamina perigyna.*

27. **URGINEA.** Perianthium 6-partitum segmentis vittatis albidis raro luteis. Semina magna discoidea uniseriata. *Regio medit., Ind. Or., Afr. Trop., Cap. B. Spei.*

28. **EUCOMIS.** Perianthium viride basi connatum. Racemus coma foliorum coronatus. Semina parva turgida. *Capenses.*

29. **WHITEHEADIA.** Perianthium viride basi connatum. Bracteæ magnæ conformes flores occultantes. Semina parva turgida. *Cap. B. Spei.*

30. **DRIMIOPSIS.** Perianthium 6-partitum segmentis albidis cucullatis vix vittatis. Racemi subspicati. Filamenta brevissima. Semina solitaria parva turgida. *Cap. B. Spei, Afric. Trop.*

31. **SCILLA.** Perianthium 6-partitum, cæruleum, roseo-purpureum vel viridi-purpureum, raro albidum, segmentis dorso uninervatis. Flores racemosi. Filamenta elongata. Semina parva turgida. *Europa, Oriens, Cap. B. Spei, Afr. Trop., Ind. Or., China, Japonia.*

** *Stamina hypogyna.*

32. **CAMASSIA.** Perianthium cæruleum raro albidum, segmentis omnibus late patentibus. Stamina declinata. *Amer. Bor.*

33. Ornithogalum. Perianthium albidum vel luteum, raro fulvum vel miniatum, segmentis omnibus late patentibus. Stamina recta. *Europa, Oriens, Cap. B. Spei, Africa Trop., Peruvia, Chili.*

34. Albuca. Perianthium albidum vel luteum, segmentis dorso late viridibus, 3 interioribus diutine conniventibus. *Cap. B. Spei, Africa Trop.*

Tribus 8. CHLOROGALEÆ. Herbæ bulbosæ, pedunculis parce foliatis vel nudis, floribus paniculatis.

35. Bowiea. Pedunculus nudus. Caulis late volubilis. Capsula loculicide trivalvis. *Capensis.*

36. Chlorogalum. Pedunculus rectus parce foliatus. Capsula loculicide trivalvis. *California.*

37. Nolina. Pedunculus rectus parce foliatus. Capsula septicide trivalvis. *Georgia.*

27. Urginea, *Steinh.*

Steinh. Ann. Sc. Nat. ser. 2, i. 321, t. 14, vi. 276; *Endlich. Gen.* No. 1131; *Kunth, Enum.* iv. 331; *Nees, Gen. Fl. Germ.* fasc. x. t. 4.—Squilla, *Stein. Ann. Sc. Nat.* ser. 2, vi. 279; *Jord. et Four. Ic.* t. 201–5.—Scilla, *Salisb. Gen.* 29.—Stellaris, *Mœnch, Meth.* 304, ex parte.—Ornithogali, Antherici, et Scillæ species, *auct. vet.*—Albuca, *Gawl.* ex parte.—Sypharissa, *Salisb. Gen.* 37.—Physodia, *Salisb. Gen.* 37.—Monotassa, *Salisb. Gen.* 36.

Perianthium basi 6-partitum, segmentis subæqualibus ligulato-oblongis marcescentibus apice leviter cucullatis albidis vel raro luteis dorso vittatis uni- vel pauci-nervatis nunquam saturate coloratis flore expanso omnibus patentibus vel reflexis. *Filamenta* e basi segmentorum subuniseriata elongata filiformia vel deorsum applanata antheris oblongis versatilibus. *Ovarium* sessile ovoideum ovulis in loculo pluribus superpositis; *stylus* filiformis sæpe geniculatus vel leviter declinatus; *stigma* capitatum trisulcatum. *Capsula* sessilis globosa vel oblonga, chartacea, loculicide trivalvis, profunde trisulcata, seminibus in loculo 2–10 complanatis alatis subuniseriatis. *Testa* membranacea fusco-atra. *Herbæ bulbosæ foliis angustis vel loratis sæpe hysteranthiis floribus racemosis sæpe teneris bracteis deltoideis vel linearibus basi vel medio sæpissime calcaratis.*

Segmenta perianthii, more Scillæ, *uninervata.* (Sectiones 1–4.)

§ PHYSODIA (Salisb. extens.). *Perianthium albidum parvum. Bracteæ minutæ deltoideæ.*

Filamenta papilloso-muricata .... 1. *physodes.*
Filamenta glabra.
Folia hysteranthia.
Racemus pauciflorus $1\frac{1}{2}$-pollicaris ...... 2. *pusilla.*
Racemus multiflorus pedalis .... 3. *micrantha.*
Folia synanthia filiformia.
Folia setacea $\frac{1}{6}$–$\frac{1}{4}$ lin. crassa .... 4. *nematodes.*
Folia subulata $\frac{1}{2}$–$\frac{3}{4}$ lin. lata .... 5. *congesta.*
Folia synanthia oblonga 5–6 lin. lata.
Folia margine subnuda..................... 6. *marginata.*
Folia margine dense setosa .... 7. *ciliata.*

§§ SYPHARISSA (Salisb. extens.). *Perianthium albidum tenerum anthericoideum. Bracteæ lineares basi sæpissime distincte calcaratæ. Bulbi parvi. Racemi* 10–30-*flori.*

Folia synanthia dura subteretia. Bracteæ basi longe calcaratæ.
Folia plura, 12–20 .... 8. *fragrans.*
Folia pauca, 2–4.
Perianthium 3–4 lin. longum......... 9. *filifolia.*
Perianthium 5–6 lin. longum.........10. *exuviata.*
Folia post scapum carnoso-herbacea. Bracteæ leviter calcaratæ.
Folia lineari-filiformia.....................11. *fugax.*
Folia anguste linearia crispata ....12. *undulata.*
Folia late linearia plana ....13. *anthericoides.*

§§§ SQUILLA (Steinheil). *Perianthium albidum firmius ornithogaloideum. Bracteæ lineares supra basin sæpissime calcaratæ. Bulbi magni. Racemi* 50–100-*flori et ultra. Folia hysteranthia lorata-lanceolata.*

Stylus rectus. Bracteæ medio calcaratæ.
Semina in loculo 2–3 ....14. *altissima.*
Semina in loculo 10–12 ....15. *maritima.*
Stylus geniculatus. Bracteæ basi leviter calcaratæ.
16. *sinensis.*

§§§§ MONOTASSA (Salisb.). *Perianthium luteum, segmentis purpureo-carinatis.*

Species sola ....17. *secunda.*

§§§§§ ALBUCOPSIS, Baker. *Segmenta perianthii more* Albucæ *dorso 2-paucinervata.*

Bracteæ minutæ deltoideæ evanescentes.
Capsula acuta ....18. *indica.*
Capsula obtusa.................................19. *zambesiaca.*
Bracteæ lineari-lanceolatæ persistentes.
Bracteæ pedicellis æquilongæ...............20. *Beccarii.*
Bracteæ pedicellos breves duplo superantes.
Perianthium parvum, 3–4 lin. longum.
Racemus laxe 3–6-florus...............21. *Quartiniana.*
Racemus subdense 30–40-florus......22. *Petitiana.*
Perianthium magnum, 8–9 lin. longum.
Folia lanceolata margine ciliata......23. *grandiflora.*
Folia lorata margine glabra ....24. *nigritana.*

1. U. PHYSODES, *Baker.*—Anthericum physodes, *Jacq. Ic.* t. 418; *Schultes fil. Syst.* vii. 473.—Albuca physodes, *Gawl. Bot. Mag.* t. 1046. —Cæsia physodes, *Spreng. Syst.* ii. 88.—Idothea? physodes, *Kunth, Enum.* iv. 345. Bulbus globosus 18–21 lin. crassus purpurascens. Folia post scapum 5–6 lanceolata carnoso-herbacea glabra 6–9 poll. longa, 12–18 lin. lata. Scapus gracilis semipedalis. Racemi subdense 30–60-flori expansi 3–5 poll. longi, cylindrici. Pedicelli subpatentes 8–10 lin. longi. Bracteæ minutæ deltoideæ. Perianthium inodorum 3 lin. longum segmentis oblongis albidis purpureo-carinatis. Filamenta 2 lin. longa lanceolata papillosa. Stylus filiformis ovario æquilongus. Capsula ovoidea 5–6 lin. longa loculis dispermis. *Cap. B. Spei.*

2. U? PUSILLA, *Baker.*—Anthericum pusillum, *Jacq. Ic.* t. 417; *Schultes fil. Syst.* vii. 474.—Cæsia pusilla, *Spreng. Syst.* ii. 88.—Idothea? drimioides, *Kunth, Enum.* iv. 345. Bulbus globosus albus 12–15 lin. crassus. Folia post scapum 10–12-linearia glabra $2\frac{1}{2}$–3 poll. longa 2–3 lin. lata acutula. Scapus filiformis teres 2–4-pollicaris inferne villosus, purpureus. Racemi deltoidei 15–20-flori, 15–18 lin. longi et lati. Pedicelli demum patentes 4–6 lin. longi. Bracteæ minutæ deltoideæ. Perianthium 2–$2\frac{1}{2}$ lin. longum albidum segmentis oblongis viridi-carinatis. Filamenta lanceolata $1\frac{1}{2}$–2 lin. longa. Stylus filiformis 1 lin. longus. Capsula ignota. *Cap. B. Spei.*

3. U. MICRANTHA, *Solms, in Schwein. Beitr.* 294?—Scilla micrantha, *A. Rich. Fl. Abyss.* ii. 328? Bulbus $1\frac{1}{2}$–2 poll. crassus. Folia hysteranthia ignota. Scapus pedalis et ultra. Racemus cylindricus densiusculus, expansus, ultra pedem longus, 15–18 lin. latus. Pedicelli stricti subpatentes 6–8 lin. longi apice articulati. Bracteæ minutæ deltoideæ evanescentes. Perianthium subcylindricum 2 lin. longum

segmentis ligulatis ½ lin. latis 1-nervatis obscure purpureo-carinatis. Filamenta 1 lin. longa deorsum applanata. Stylus rectus ½ lin. longus. Capsula ignota. *Africa tropicalis; Madi*, Speke and Grant, 702! *Abyssinia*, Quartin-Dillon (non vidi: an eadem?).

4. U.? NEMATODES, *Baker*.—Anthericum filifolium, *Thunb. Prodr.* 62, non *Jacq.*—Anthericum nematodes, *Schultes fil. Syst.* vii. 472.—Ornithogalum Thunbergii, *Kunth, Enum.* iv. 369.—Bulbus ovoideus. Folia synanthia 10–12 setacea dura flexuosa glabra 1½–2 poll. longa, $\frac{1}{6}$–¼ lin. crassa. Scapus strictus teres gracillimus 1½–3-pollicaris. Racemus laxe 20–40-florus, expansus 1½–3 poll. longus, 6–7 lin. latus. Pedicelli ascendentes vel deflexi 1½–2 lin. longi. Bracteæ minutissimæ deltoideæ. Perianthium 2 lin. longum segmentis oblongis albidis purpureo-carinatis ½ lin. latis. Filamenta 1–1½ lin. longa alterna lanceolata. Stylus filiformis 1 lin. longus. Capsula ignota. *Cap. B. Spei*, Thunberg!

5. U. CONGESTA, *Wight, Icones*, t. 2064, fig. *sinistr.* Bulbus ovoideus 9–15 lin. crassus. Folia synanthia carnoso-herbacea glabra lineari-filiformia 5–6 poll. longa, 1 lin. lata, facie canaliculata. Scapus flexuosus semipedalis. Racemi dense 20–30-flori, expansi oblongi 1½–2 poll. longi, 7–8 lin. lati. Pedicelli stricti ascendentes 1–1½ lin. longi. Bracteæ minutæ deltoideæ. Perianthium albidum 2–2½ lin. longum, segmentis oblongis obtusis dorso fuscis 1-nervatis. Filamenta 1½ lin. longa basi applanata. Stylus filiformis ovario æquilongus. Capsula subglobosa 4–4½ lin. longa seminibus in loculis 3–4. *India orientalis peninsularis*, Dr. Wight!

6. U.? MARGINATA, *Baker*.—Anthericum marginatum, *Thunb. Prodr.* 63, *Schultes fil. Syst.* vii. 474.—Idothea? marginata, *Kunth, Enum.* iv. 346. Bulbum non vidi. Folia synanthia? "circiter bina" oblongo-oblanceolata rigide coriacea 18–21 lin. longa, 5–6 lin. lata glabra lucidula multinervata margine incrassata vix ciliata. Scapus 6–7-pollicaris gracillimus flexuosus. Racemus subcapitatus 10–20-florus, pedicellis patentibus gracillimis 6–10 lin. longis. Bracteæ minutissimæ deltoideæ. Perianthium 1½–2 lin. longum segmentis albidis purpureo-carinatis ½ lin. latis. Filamenta filiformia 1 lin. longa. Stylus filiformis ½ lin. longus. Capsula ignota. *Cap. B. Spei*, Thunberg!

7. U.? CILIATA, *Baker*.—Ornithogalum ciliatum, *Linn. Suppl.* 199; *Thunb. Prodr.* 62; *Schultes fil. Syst.* viii. 528; *Kunth, Enum.* iv. 359. Bulbum non vidi. Folia 2 synanthia oblongo-spathulata acuta 10–12 lin. longa, 5–6 lin. lata rigide coriacea facie glabra lucidula margine incrassata setis nigrescentibus densis persistentibus minutis ciliata. Scapus gracilis 5–8-pollicaris. Racemus 20–30-florus ex-

pansus 1½–2 poll. longus, 9–10 lin. latus. Pedicelli stricti patentes 3–4 lin. longi apice cernui. Bracteæ minutissimæ deltoideæ. Perianthium campanulatum 1½ lin. longum segmentis albidis purpureo-carinatis. Filamenta filiformia ½ lin. longa. Stylus rectus filiformis brevissimus. Capsula ignota. *Cap. B. Spei,* Thunberg!

8. U. FRAGRANS, *Stein. Ann. Sc. Nat.* ser. 2, vol. i. p. 330.—Anthericum fragrans, *Jacq. Hort. Schön.* t. 86; *Willd. Sp.* ii. 135; *Schultes, fil. Syst.* vii. 470.—Albuca fugax, *Gawl. Bot. Reg.* t. 311.—Ornithogalum fragrans, *Kunth, Enum.* iv. 366.—Sypharissa fragrans, *Salisb. Gen.* 37. Bulbus globosus 1½–2 poll. crassus sursum squamosus vaginis haud productis. Folia 12–20 synanthia semiteretia glabra persistentia 6–8 poll. longa, ½ lin. lata. Scapus gracilis teres glaucus pedalis. Racemus sublaxe 12–20-florus expansus 4–6-pollicaris. Pedicelli 4–6 lin. longi. Bracteæ lanceolatæ basi calcaratæ persistentes. Perianthium odorum 5–6 lin. longum segmentis oblongis albidis purpureo-carinatis. Filamenta filiformia 2½–3 lin. longa leviter declinata. Stylus 3 lin. longus leviter declinatus. *Cap. B. Spei,* Masson! etc.

9. U. FILIFOLIA, *Stein. Ann. Sc. Nat.* ser. 2, vol. i. 330.—Anthericum filifolium, *Jacq. Ic.* t. 414; *Schultes, Syst.* vii. 471, non *Thunberg.*—Albuca filifolia, *Gawl. Bot. Reg.* t. 557.—Ornithogalum filifolium, *Kunth, Enum.* iv. 369.—Sypharissa filifolia, *Salisb. Gen.* 38.—Anthericum spiratum, *Thunb. Prodr.* 62; *Kunth, Enum.* iv. 656. Bulbus globosus 1 poll. crassus fusco-tunicatus squamis exterioribus productis vittatis. Folia 3–6 synanthia filiformia dura glabra flexuosa 8–12 poll. longa, ¼–½ lin. crassa. Scapus erectus gracilis 6–15-pollicaris. Racemus subdense 6–20-florus expansus 2–3 poll. longus. Pedicelli 3–6 lin. longi. Bracteæ lanceolatæ persistentes 2–3 lin. longæ, inferiores longe calcaratæ. Perianthium inodorum 3–4 lin. longum segmentis oblongis 2 lin. latis albidis purpureo-carinatis. Filamenta filiformia 1½ lin. longa. Stylus 2 lin. longus leviter declinatus. *Cap. B. Spei,* Thunberg! Drege, 2677 *b*! 8644 *a*! Zeyher! Burchell, 6907, etc.

10. U. EXUVIATA, *Steinh. Ann. Sc. Nat.* ser 2, vol. i. 330.—Anthericum exuviatum, *Jacq. Ic.* t. 415; *Schultes, Syst.* vii. 471.—Albuca exuviata, *Gawl. Bot. Mag.* t. 871.—Ornithogalum? exuviatum, *Kunth, Enum.* iv. 369.—Sypharissa exuviata, *Salisb. Gen.* 37. Bulbus globosus 12–21 lin. crassus squamis exterioribus longe productis transversim vittatis. Folia 2–4 synanthia dura semiteretia glabra flexuosa 12–18 lin. longa, ½–¾ lin. lata. Scapus gracilis pedalis–sesquipedalis. Racemi subdense 10–20-flori expansi 2–4 poll. longi. Pedicelli ascendentes, inferiores 4–6 lin. longi. Bracteæ lanceolatæ persistentes pedicellis breviores, inferiores longe calcaratæ. Perianthium 5–6 lin.

longum segmentis albidis anguste purpureo-carinatis 2–3 lin. latis. Filamenta filiformia 2 lin. longa. Stylus 2–2½ lin. longus leviter declinatus. *Cap. B. Spei,* Zeyher, 4248! Ab *U. filifolia* præsertim differt floribus majoribus tunicis exterioribus magis productis 4–5 poll. longis.

11. U. FUGAX, *Steinh. Ann. Sc. Nat.* ser. 2, vol. i. p. 328, t. 14. fig. 1; *Nees, Gen. Fl. Germ.* x. t. 4; *Kunth, Enum.* iv. 335.—Anthericum fugax, *Moris, Elench.* i. 46; *Schultes, fil. Syst.* vii. 474. Bulbus ovoideus 9–12 lin. crassus membranaceo-tunicatus. Folia post scapum 3–4 lineari-filiformia carnoso-herbacea glabra scapo breviora. Scapi 1–2 stricti vel flexuosi 3–12 poll. longi graciles fragiles. Racemus 6–30-florus 1–3 poll. longus. Pedicelli diutine ascendentes 3–6 lin. longi. Bracteæ lineares minutæ evanescentes basi obscure calcaratæ. Perianthium 3–4 lin. longum segmentis ligulatis membranaceis albidis 1 lin. latis anguste purpureo-carinatis. Filamenta filiformia segmentis paulo breviora. Ovarium oblongum ovulis in loculo 6–8. Stylus filiformis leviter declinatus. Capsula turbinata 3–4 lin. longa seminibus in loculo 4–5. *Sardinia,* Muller! Thomas! *Algeria,* Steinheil! Bové! etc.

12. U. UNDULATA, *Stein. Ann. Sc. Nat.* ser. 2, vol. i. p. 330; *Kunth, Enum.* iv. 334; *Gren. Fl. France,* iii. 184; *Parl. Fl. Ital.* ii. 456.—Scilla undulata, *Desf. Atlant.* i. 300, t. 88; *Poir. Encyc.* vi. 742. Bulbus ovoideus 9–12 lin. crassus. Folia post scapum, 4–6, linearia carnoso-herbacea, demum 6–9 poll. longa, 2–3 lin. lata valde undulato-crispata. Scapi graciles fragiles 6–9-pollicares. Racemi sublaxe 12–30-flori expansi 3–5 poll. longi. Pedicelli diutine ascendentes 2–3 lin. longi. Bracteæ lineares 1½–2 lin. longæ, evanescentes basi leviter calcaratæ. Perianthium 4–5 lin. longum segmentis ligulatis membranaceis anguste purpureo-vittatis. Stylus demum exsertus leviter declinatus. Capsula oblonga 5–6 lin. longa seminibus in loculo 3–4. *Corsica,* Serafino! *Sardinia,* Thomas! *Algeria,* Munby! etc. *Ægyptus,* teste Parlatore.

13. U. ANTHERICOIDES, *Steinh. Ann. Sc. Nat.* ser. 2, vol. i. 328; *Kunth, Enum.* iv. 333; *Durieu, Expl. Algér.* t. 45.—Squilla anthericoides, *Jord. et Fourr. Icones,* t. 205.—Scilla anthericoides, *Poir. It.* ii. 150; *Encyc.* vi. 741.—S. serotina, *Schousb. Maroc.* 165.—Bulbus ovoideus 12–15 lin. crassus. Folia post scapum 5–6 linearia carnoso-herbacea glabra 9–10 poll. longa, 1 poll. lata. Scapi 1–3 graciles fragiles 6–12-pollicares. Racemi subdensi 12–30-flori expansi 3–6 poll. longi. Pedicelli diutine ascendentes infimi 3–6 lin. longi. Bracteæ lineares minutæ evanescentes basi minute calcaratæ. Perianthium 5–6 lin. longum segmentis ligulatis membranaceis albidis anguste purpureo-vittatis. Filamenta filiformia 3–4 lin. longa. Stylus filiformis 3–4 lin. longus leviter declinatus demum exsertus. Capsula turbinata 6–7 lin. longa seminibus in loculo 5–6. *Algeria,* Jamin, 113!

14. U. ALTISSIMA, *Baker*.—Ornithogalum altissimum, *Linn. Sp. Plant.* 199; *Thunb. Prodr.* 62; *Schultes, fil. Syst.* vii. 521; *Kunth, Enum.* iv. 357.—Drimia altissima, *Gawl. Bot. Mag.* t. 1074.—Ornithogalum giganteum, *Jacq. Hort. Schön.* t. 87.—Scilla africana, *Commel. Hort.* 187, t. 94. Bulbus globosus 4–6 poll. crassus. Folia hysteranthia 5–6 lorato-lanceolata glabra 12–18 poll. longa basi 1½–2 poll. lata ad apicem acutum sensim angustata. Scapus 2–3-pedalis, semipollicem vel ultra crassus. Racemi cylindrici densiflori 1–2-pedales expansi 1½–2 poll. lati. Pedicelli subpatentes vel ascendentes, inferiores 6–9 lin. longi. Bracteæ lineares 2–3 lin. longæ infra medium distincte calcaratæ. Perianthium subcampanulatum 3–4 lin. longum inodorum segmentis albidis ligulatis vix ultra 1 lin. latis purpureo-viridi carinatis 1-nervatis. Filamenta 2–3 lin. longa leviter applanata. Stylus rectus 1½–2 lin. longus. Capsula globosa seminibus in loculo 2–3. *Cap. B. Spei,* Burchell, 4403! Zeyher, 608! Bolus, 649! etc; *Africa tropicalis; in ditione fluv. Zambesi ad montes Manganja,* Dr. Meller! *Nigritia,* Barter, 3432! (*v. v. in hort. Kew.*).

15. U. MARITIMA, *Baker*.—Scilla maritima, *Linn. Sp.* 442; *Willd. Sp.* ii. 125; *Red. Lil.* t. 116.—Ornithogalum maritimum, *Brot. Lus.* i. 533; *Lam. Gall.* iii. 276.—Squilla maritima, *Steinh. Ann. Sc. Nat.* ser. 2, vi. 276.—Urginea Scilla, *Steinh. Ann. Sc. Nat.* ser. 2, i. 321.—Stellaris Scilla, *Mœnch, Meth.* 304.—Ornithogalum Squilla, *Gawl. Bot. Mag.* t. 918. Bulbus ovoideus 4–6 poll. crassus. Folia hyemalia 10–20 lanceolata carnoso-herbacea glauco-viridia glabra 12–18 poll. longa supra medium 2–4 poll. lata. Scapus 1–3-pedalis teres rubescens, basi 3–6 lin. crassus. Racemus autumnalis densus pedalis vel ultra 12–18 lin. latus. Pedicelli 6–9 lin. longi. Bracteæ lineares geminatæ 2–3 lin. longæ infra medium calcaratæ subpersistentes. Perianthium 3–4 lin. longum segmentis oblongis albidis 1-nervatis viridi-purpureo carinatis. Filamenta 1½–2 lin. longa basi applanata. Stylus 1 lin. longus rectus. Capsula obovoidea 6–7 lin. longa seminibus in loculo 10–12. *Ab insulis Canariæ ad Syriam; Cap. B. Spei,* Drege, 3527!—SQUILLA PANCRATION, *Steinh. Ann. Sc. Nat.* ser. 2, vi. 279, dicitur ab typo differre bulbo dimidio minore, ovario et antheris cæruleo-virescentibus, foliis minoribus pedicellis brevioribus; S. NUMIDICA, *Jord. et Four. Ic.* t. 201, est varietas Algeriensis bulbo maximo tunicis rubris racemo longissimo pedicellis albidis diutine ascendentibus infimis 4–5 lin. longis, ovario et antheris luteo-viridibus; S. SPHÆROIDEA, *Jord. et Four. Ic.* t. 202 (Algeria) bulbo minore magis globoso, tunicis rubris, foliis minoribus, racemo laxiore pedicellis albidis diutine ascendentibus, infimis 6–9 lin. longis, ovario et antheris luteis; S. INSULARIS, *Jourd. et Four. Ic.* t. 203 (Corsica), bulbo ovoideo mediocri tunicis virescentibus, pedicellis albidis infimis 6–7 lin. longis fructiferis decurvatis, ovario et antheris viridibus; et S. LIT-

TORALIS, *Jord. et Four. Ic.* t. 204 (Sicilia), bulbo ovoideo mediocri tunicis virescentibus, racemo laxiusculo, foliis minoribus, pedicellis rubris diutine ascendentibus infimis 9–12 lin. longis, ovario et antheris viridibus, perianthii segmentis latioribus.

16. U. SIMENSIS, *Schwein. Beitr.* 291.—Scilla simensis, *Hochst. in Schimp. Abyss. Exsic.* No. 1317; *A. Rich. Fl. Abyss.* ii. 327. Bulbus magnus ovoideus 3–4 poll. crassus. Folia hysteranthia ignota. Scapus 1½–2-pedalis basi 3–4 lin. crassus. Racemus dense 30–50-florus expansus 4–6-pollicaris. Pedicelli diutine ascendentes 3–4 lin. longi. Bracteæ lineares evanescentes inferiores basi leviter calcaratæ 2–3 lin. longæ. Perianthium 4–4½ lin. longum segmentis albidis purpureo tinctis lanceolatis 1 lin. latis 1-nervatis obscure purpureo-carinatis. Filamenta linearia 1½ lin. longa. Stylus filiformis geniculatus 1–1½ lin. longus. Capsula globosa 5–6 lin. longa. *Abyssinia,* Schimper, ii. 1317!

17. U? SECUNDA, *Baker.*—Ornithogalum secundum, *Jacq. Ic.* t. 433; *Schultes, fil. Syst.* vii. 527; *Kunth, Enum.* iv. 369.—Monotassa secunda, *Salisb. Gen.* 36. Bulbus globosus 8–9 lin. crassus albidus. Folia post scapum, 5–6, lineari-subulata 3–5 poll. longa 2–3 lin. lata erectiuscula glabra ad oras cartilagineo-muricata. Scapus gracilis autumnalis 4–6-pollicaris. Racemi laxe 5–6-flori subsecundi. Pedicelli erecto-patentes, inferiores subpollicares. Bracteæ lanceolatæ 3–4 lin. longæ. Perianthium 5–6 lin. longum segmentis oblongis 2 lin. latis luteis purpureo-carinatis. Filamenta 2½–3 lin. longa leviter applanata. Stylus filiformis 3 lin. longus. Capsulam non vidi. *Cap. B. Spei,* Drege, 1513 *a*! etc.

18. U. INDICA, *Kunth, Enum.* iv. 333; *Wight, Icones,* t. 2063.—Scilla indica, *Roxb. Fl. Ind.* ii. 147.—S. coromandeliana, *Roxb. Fl. Ind. loc. cit.*; *Kunth, Enum.* iv. 331.—U. senegalensis, *Kunth, Enum.* iv. 334.—Scilla Cundria et denudata, *Hamilt. in Wall. Cat.* No. 5062. Bulbus pallidus 2–4 poll. crassus ovoideus. Folia hysteranthia linearia carnoso-herbacea glabra 6–12 poll. longa, 2–3 lin. lata. Scapus fragilis 1–2-pedalis basi 2–3 lin. crassus. Racemus laxissime 12–30-florus expansus 6–12 poll. longus vel ultra, 2–3 poll. latus. Pedicelli graciles sæpe subpatentes 12–15 lin. longi apice cernui. Bracteæ minutæ deltoideæ evanescentes. Perianthium 4–6 lin. longum tenerum segmentis albido-viridibus medio viridibus 2–3-nervatis. Filamenta 2½–3 lin. longa deorsum applanata. Stylus rectus 1–1½ lin. longus. Capsula 6–9 lin. longa oblonga subacuta seminibus in loculo 8–9. *India orientalis borealis,* Hamilton! Jacquemont, 614! Thomson, 1143! etc. *Coromandelia,* Roxburgh. *Abyssinia,* Beccari! *Nubia et Sennaar,* Schweinfurth; *Senegambia,* Lelièvre; *Nigritia,* Barter 1099! *Sierra Leone,* Morson!—U. COROMANDELIANA, *Wight, Icones,*

t. 2064, ex exemplis originalibus in herbario auctoris examinatis est *Dipcadi* species.

19. U. ZAMBESIACA, *Baker.* Bulbus mediocris ovoideus. Folia hysteranthia ignota. Scapus bipedalis et ultra 3–4 lin. crassus. Racemus laxe 20–30-florus, expansus ultra pedem longus, 18–21 lin. latus. Pedicelli graciles ascendentes, inferiores 9–12 lin. longi. Bracteæ minutæ deltoideæ evanescentes. Perianthium 5–6 lin. longum segmentis albido-viridibus late viridi-carinatis indistincte 2–3-nervatis. Filamenta 2½–3 lin. longa applanata basi deltoidea valvata. Stylus filiformis geniculatus 2–2½ lin. longus. Capsula globosa obtusa 5–6 lin. longa. *Africa tropicalis austro-orientalis,* 14–19 S. lat. (*Expedition Island*), Dr. Kirk. Habitus omnino *U. indicæ,* sed differt stylo longiore et capsula obtusa.

20. U. BECCARII, *Baker.* Bulbus ovoideus 1½ poll. crassus. Folia synanthia glabra lanceolata carnoso-herbacea 5–6 poll. longa basi pollicem lata ad apicem acutum sensim angustata. Scapus 6–7-uncialis. Racemus sublaxe 10–15-florus expansus 5–6 poll. longus 12–15 lin. latus. Pedicelli 4–6 lin. longi. Bracteæ persistentes 5–6 lin. longæ. Perianthium tenerum 6–7 lin. longum segmentis oblongis 2–3 lin. latis albidis late obscure viridi-carinatis multinervatis. Filamenta 4½–5 lin. longa leviter applanata. Stylus rectus filiformis 4½–5 lin. longus. Capsula ignota. *Abyssinia,* Beccari, 121!

21. U. QUARTINIANA, *Solms in Schwein. Beitr.* 284.—Scilla Quartiniana, *A. Rich. Fl. Abyss.* ii. 329. Bulbus parvulus ovoideus. Folia linearia acuta glabra. Scapus gracilis palmaris. Racemus laxe 3–6-florus, pedicellis brevibus, bracteis linearibus pedicellos duplo superantibus. Perianthium 3–4 lin. longum segmentis oblongis in medio crassioribus margine tenuissimis. Filamenta segmentis paulo breviora. Capsula ignota. *Abyssinia,* Quartin-Dillon (non vidi).

22. U. PETITIANA, *Solms in Schwein. Beitr.* 294.—Scilla Petitiana, *A. Rich. Fl. Abyss.* ii. 238. Bulbus subglobosus 1–1½ poll. crassus. Folia (non vidi) hysteranthia "linearia acuta glabra." Scapus 1½–2-pedalis, modice robustus. Racemus linearis, subdense 30–40-florus expansus semipedalis vel ultra 3–4 lin. latus. Pedicelli stricti erecto-patentes, infimi 1½–2 lin. longi. Bracteæ persistentes lineari-subulatæ 3–4 lin. longæ basi haud calcaratæ. Perianthium 2½–3 lin. longum segmentis ligulatis basi distincte coalitis albidis obscure late viridi-carinatis 2–3-nervatis. Filamenta linearia 1½ lin. longa. Stylus geniculatus 1 lin. longus. *Abyssinia,* Petit; *Matamma,* Schweinfurth, 21!

23. U. GRANDIFLORA, *Baker.* Bulbus elongato-ovoideus 12–15 lin. crassus. Folia 3–4 synanthia lanceolata carnoso-herbacea 5–6 poll.

longa basi 6–9 lin. lata facie glabra margine crispata pilis mollibus albidis brevibus dense persistenter ciliata. Scapus semipedalis. Racemus subdense 6–8-florus. Pedicelli erecto-patentes infimi 1½–2 lin. longi. Bracteæ lineares persistentes 4–6 lin. longæ. Perianthium 8–9 lin. longum segmentis oblongo-lanceolatis 2–3 lin. latis teneris albidis late viridi-carinatis multinervatis. Filamenta 5–6 lin. longa deorsum leviter applanata. Stylus rectus filiformis 6–7 lin. longus. Capsula ignota. *In ditione Maris Rubri, Hor Tamanib, alt.* 600 *pedes,* Lord!

24. U. NIGRITANA, *Baker.* Folia synanthia lorata carnoso-herbacea sesquipedalia vel ultra 5–6 lin. longa margine glabra. Scapus 1½–2-pedalis vel ultra. Racemus laxus 12–18-florus expansus semipedalis. Pedicelli ascendentes, infimi 3–4 lin. longi. Bracteæ lanceolatæ acuminatæ 6–8 lin. longæ. Perianthium 8–9 lin. longum segmentis oblongis 2½–3 lin. latis teneris albidis dorso late carinatis distincte 5–6-nervatis. Filamenta 5–6 lin. longa basi lanceolata. Stylus filiformis 5–6 lin. longus. *Guinea borealis, in ditione Nigritana,* Barter, 3335!

28. EUCOMIS, *L'Hérit.*

L'Hérit. Sert. Angl. 17; *Roem. et Schultes, Syst.* No. 1411; *Endlich. Gen.* No. 1128; *Kunth, Enum.* iv. 301; *Salisb. Gen.* 17; *Harv. Cap. Gen.* 2nd edit. 396.—Basilæa, *Juss. Gen.* 52.—Fritillariæ et Ornithogali, sp. *Auct. vet.*

Perianthium basi connatum segmentis subæqualibus lanceolatis viridibus marcescentibus flore expanso supra basin subpatentibus. *Stamina* 6 alte perigyna filamentis subulatis deorsum leviter applanatis *antheris* oblongis versatilibus. *Ovarium* sessile ovoideum ovulis in loculo pluribus; *stylus* filiformis leviter curvatus; *stigma* minutum capitatum. *Capsula* sessilis globosa profunde trisulcata membranacea loculicide trivalvis, seminibus in loculo 3–9 haud compressis. *Testa* membranacea atro-castanea. *Herbæ acaules bulbosæ floribus copiose cylindrico-racemosis bracteis superioribus foliaceis multis sterilibus comam ad apicem racemi efformantibus.*

Scapus subcylindricus.
  Racemi laxi pedicellis 6–15 lin. longis .... 1. *punctata.*
  Racemi densi pedicellis 2–4 lin. longis........ 2. *undulata.*
Scapus ex apice ad basin attenuatus.
  Pedicelli 2–4 lin. longi .... 3. *regia.*
  Pedicelli subnulli .... 4. *nana.*

1. E. PUNCTATA, *L'Hérit. Sert. Angl.* 18, t. 19; *Bot. Mag.* t. 913; *Red. Lil.* t. 208; *Kunth, Enum.* iv. 302.—Ornithogalum punctatum, *Thunb. Prodr.* 62.—Basilæa punctata, *Lam. Ill.* t. 289. fig. 2. Folia 6–9 lorato-lanceolata 12–24 poll. longa, 2–3 poll. lata planiuscula minus carnosa quam in speciebus alteris, dorso sæpe purpureo striata vel punctata, exteriora sæpe subpetiolata. Scapus cylindricus 6–12 poll. longus, 4–6 lin. crassus sæpe punctatus. Racemi sublaxe 40–100-flori expansi 6–12 poll. vel ultra longi 2–3 poll. crassi. Pedicelli ascendentes 6–15 lin. longi. Bracteæ lanceolatæ 3–6 lin. longæ. Perianthium 5–6 lin. longum. Folia comæ 12–20 planiuscula lanceolata 1–2 poll. longa. Capsula obovoidea truncata 5–6 lin. longa. *Cap. B. Spei,* Atherstone! MacOwan! etc. *In ditione fluminis Orange,* Cooper, 1195! *Natal,* Sanderson 568! (*v. v. in hort. Kew. etc.*).—E. STRIATA, *Don, Hort. Cant.* vi. 86 (*Bot. Mag.* t. 1539), est forma foliis dorso purpureo vittatis.

2. E. UNDULATA, *Ait. Hort. Kew.* i. 433; *Bot. Mag.* t. 1083; *Schultes, fil. Syst.* vii. 622; *Kunth, Enum.* iv. 302.—Ornithogalum undulatum, *Thunb. Prodr.* 62.—Basilæa coronata, *Lam. Encyc.* i. 382. Folia 6–9 lorato-lanceolata 6–12 poll. longa, 1½–2 vel in exemplis cultis 3 poll. lata carnoso-herbacea acuta vel subobtusa margine undulato-crispata. Scapus subcylindricus 3–9-pollicaris, 3–4 lin. crassus sicut folia nullo modo maculata. Racemus dense 30–50-florus expansus 2–4 poll. longus, 1½–2 poll. crassus. Pedicelli 2–4 lin. longi. Bracteæ lanceolatæ 2–3 lin. longæ. Perianthium 6–7 lin. longum. Folia comæ 20–30 lanceolata 1½–2 poll. longa margine crispata. *Cap. B. Spei,* Zeyher, 102! Burchell, 2701! etc; *Kaffraria,* Mrs. Barber! *Natal,* Sanderson! (*v. v. in hort. Kew., Saunders, &c.*; *v. s. ex hort. Fothergill,* anno 1780).

3. E. REGIA, *Ait. Hort. Kew.* i. 433; *Schultes, fil. Syst.* vii. 623; *Kunth, Enum.* iv. 302.—E. clavata, *Baker in Saund. Ref. Bot.* t. 238.—E. macrophylla, *Hort.* Folia 6–9 linguæformia 12–18 poll. longa supra medium 3–5 poll. lata subacuta dimidio inferiore sensim angustata margine denticulata vix undulata, carnoso-herbacea, nullo modo punctata. Scapus clavatus 3–4-pollicaris, basi 8–9 lin. apice 12–15 lin. crassus. Racemus dense 40–80-florus expansus 4–8 poll. longus 2½–3 poll. crassus. Pedicelli 2–4 lin. longi. Bracteæ lineares 3–6 lin. longæ. Perianthium 6–8 lin. longum. Folia comæ lanceolata 1½–2 poll. longa planiuscula. *Cap. B. Spei,* herb. Aiton! *Natal,* MacKen! *in ditione fluminis Orange,* Cooper, 1196! (*v. v. in hort. Saund.*). Inter *undulatam* et *nanam* medium tenens.

4. E. NANA, *Ait. Hort. Kew.* i. 432; *Jacq. Schoenb.* t. 92; *Bot. Mag.* t. 1495; *Schultes, fil. Syst.* vii. 623; *Kunth, Enum.* iv. 302.—Ornithogalum nanum, *Thunb. Prodr.* 62.—Basilæa nana, *Poir. Encyc. Suppl.* i. 590. Folia 5–6 lingulata subobtusa planiuscula 8–12 poll.

longa supra medium 2–3 poll. lata, margine denticulata haud undulata carnoso-herbacea. Scapus clavatus 3–6-pollicaris, apice 8–12 lin. crassus. Racemi dense 20–40-flori 2–4 poll. longi, $1\frac{1}{2}$–2 poll. crassi. Pedicelli robusti brevissimi. Perianthium 6 lin. longum. Folia comæ 12–20 lanceolata $1\frac{1}{2}$–2 poll. longa planiuscula. *Cap. B. Spei,* Masson! etc.—E. PURPUREOCAULIS, *Andr. Bot. Rep.* t. 369, est forma scapo purpureo.

29. WHITEHEADIA, *Harvey.*

Harvey, Cape Gen. 2nd edit. 396.—Eucomis, sp. *Jacq.*

Perianthium basi connatum, segmentis subæqualibus lanceolatis viridibus obscure 3–5-nervatis marcescentibus flore expanso supra basin subpatulis. *Stamina* 6 leviter exserta filamentis albidis filiformibus basi dilatatis connatis *antheris* lineari-oblongis versatilibus. *Ovarium* sessile globosum loculis multiovulatis; *stylus* filiformis apice uncinatus; *stigma* capitatum. *Capsula* magna globosa sessilis acute angulata membranacea loculicide trivalvis, seminibus in loculo 10–12 parvis lagenæformibus haud compressis. *Testa* membranacea nitida nigra. *Inter Eucomem et Massoniam medium tenens, foliis posterioris.*

1. W. BIFOLIA, *Baker.*—Eucomis bifolia, *Jacq. Ic.* t. 449; *Willd. Sp.* ii. 92; *Bot. Mag.* t. 840; *Kunth, Enum.* iv. 303.—Whiteheadia latifolia, *Harv. Cap. Gen.* (*loc. cit.*).—Melanthium massoniæfolium, *Andr. Bot. Rep.* t. 368.—Basilæa bifolia, *Poir. Encyc. Suppl.* i. 591. Bulbus globosus $1\frac{1}{2}$–2 poll. crassus tunicis crassis carnosis fuscis. Folia 2 opposita oblongo-rotundata glabra membranaceo-carnosa 6–8 poll. longa, 4–6 poll. lata subacuta vel emarginata 60–90-nervata. Scapus clavatus, semipedalis. Racemus densus, 3–6 poll. longus. Bracteæ rotundato-cuspidatæ amplexicaules membranaceæ 12–15 lin. longæ, superiores steriles. Perianthium subsessile solitarium occultum $4\frac{1}{2}$–5 lin. longum. Capsula 8–9 lin. longa. *Cap. B. Spei,* Whitehead! etc.

30. DRIMIOPSIS, *Lindl.*

Lindl. in Paxt. Flow. Gard. ii. 73; *Baker in Saund. Ref. Bot.* iii. App. p. 17.

Perianthium albidum segmentis subæqualibus ovatis apice distincte cucullatis basi connatis flore expanso ascendentibus haud reflexis dorso nullo modo vel indistincte vittatis. *Stamina* 6 subuniseriata distincte perigyna filamentis brevissimis clavatofiliformibus *antheris* oblongo-rotundatis versatilibus. *Ovarium* sessile globosum trisulcatum ovulis in loculo geminis collateralibus; *stylus* erectus crassiusculus ovario subæquilongus; *stigma* capitatum. *Capsula* globosa parva sessilis loculicide trivalvis seminibus in loculo solitariis obovoideis haud compressis. *Testa* nigra. *Herbæ bulbosæ foliis synanthiis floribus inconspicuis parvis dense racemoso-spicatis bracteis abortivis.*

Folia cordata distincte petiolata.
  Perianthium 1½–2 lin. longum .... 1. *maculata.*
  Perianthium 1 lin. longum .... 2. *minor.*
Folia basi angustata.
  Folia oblonga-lanceolata carnoso-herbacea infra medium latiora.
    Perianthium 1½–2 lin. longum .... 3. *botryoides.*
    Perianthium 1 lin. longum .... 4. *Burkei.*
  Folia lingulata, firmiora, supra medium latiora. 5. *Barteri.*

1. D. MACULATA, *Lindl. in Paxt. Flow. Gard.* ii. 73, cum icone; *Baker in Saund. Ref. Bot.* iii. t. 191, App. 17. Folia 5–6 carnoso-herbacea cordato-ovata acuta 3–4 poll. longa, 1½–2 poll. lata facie viridia maculis saturatioribus notata. Petioli 3–6 poll. longi facie profunde canaliculati. Scapus teres 8–12-pollicaris. Racemus 12–30-florus expansus 2–3 poll. longus, 8–12 lin. latus, floribus supremis subsessilibus, inferioribus cernuis brevissime pedicellatis. Perianthium 1½–2 lin. longum. *Cap. B. Spei* (*v. v. in hort. Saunders*).

2. D. MINOR, *Baker in Saund. Ref. Bot.* iii. t. 192, App. 17. Folia 3–4 carnoso-herbacea cordato-ovata subacuta 1½–2 poll. longa 8–10 lin. lata facie viridia maculis saturatioribus notata. Petioli 1–2 poll. longi facie profunde canaliculati. Scapi graciles teretes 3–6-pollicares. Racemus densissime 12–20-florus expansus 6–12 lin. longus, 5–6 lin. latus floribus infimis patentibus brevissime pedicellatis. Perianthium 1 lin. longum segmentis late imbricatis. *Natalia,* Cooper! (*v. v. in hort. Saunders*); *ad montes fluminis Klip, alt.* 3500–4500 *pedes,* Dr. Sutherland!

3. D. BOTRYOIDES, *Baker in Saund. Ref. Bot.* iii. App. 17. Folia carnoso-herbacea oblongo-lanceolata acuta 3–4 poll. longa 15–18 lin. lata basi in petiolum 1–1½ poll. longum caulem amplectentem deltoideo-subspathulatim angustata. Scapus gracilis 6–8-pollicaris. Racemus dense 20–30-florus expansus 1½–2 poll. longus, 5–6 lin. latus, floribus inferioribus brevissime pedicellatis. Perianthium globosum 1½–2 lin. longum. *Ex Africa orientali sine loci specialis designatione exempla 2 adsunt in herb. Kew. ab Magistro Blackburn missa.*

4. D. Burkei, *Baker in Saund. Ref. Bot.* iii. App. 17. Folia 2–3 sessilia carnoso-herbacea lanceolata 2–3 poll. longa 6–9 lin. lata basi angustata caulem amplectentia. Scapus gracillimus flexuosus 1½–2-pollicaris. Racemus densissime 12–30-florus, expansus 8–12 lin. longus, 3–4 lin. latus, floribus omnibus subsessilibus. Perianthium campanulatum 1 lin. longum. *Cap. B. Spei ad ripas fluminis Aapages,* Burke!

5. D. Barteri, *Baker in Saund. Ref. Bot.* iii. App. 18. Folia 2–4, firmiora quam in speciebus reliquis, sessilia, lingulata, subacuta, facie maculata, ascendentia, 6–9 poll. longa, supra medium 6–10 lin. lata, in basin subpetiolatam caulem longe amplectentem sensim attenuata. Scapus strictus 6–8-pollicaris. Racemus 30–50-florus, expansus 1½–2½-pollicaris, 4–4½ lin. latus, floribus omnibus subsessilibus. Perianthium 1½ lin. longum segmentis late imbricatis. *Guinea borealis in collinis rupestribus in ditione fluminis Niger ad Nupe,* Barter, 1512! 3445!

31. Scilla, *Linn.*

Linn. Gen. 419 (*ex parte*); *Endl. Gen.* 1130; *Kunth, Enum.* iv. 314, *excl. spec.*; *Baker in Saund. Ref. Bot.* iii. App. 4.—Barnardia, *Lindl. Bot. Reg.* t. 1029; *Endl. Gen.* 1136; *Kunth, Enum.* iv. 336.—Stellaris, *Moench, Meth.* 304 (*ex parte*); *Steinheil, Ann. Sc. Nat.* ser. 2, vi. 386.—Adenoscilla, *Gren. Flor. Franc.* iii. 187.—Nectaroscilla, *Parlat. Nuov. Gen.* 27.—Caloscilla, *Jord. et Four. Ic.* t. 244–255.—Somera, *Salisb. Gen.* 26.—Basaltogeton, Petranthe, et Monocallis, *Salisb. Gen.* 27.—Othocallis, Rinopodium, et Prospero, *Salisb. Gen.* 28.—Ledebouria, *Roth, Nov. Sp.* 195; *Endlich. Gen.* 1076; *Kunth, Enum.* iv. 335.—Drimia, *Kunth, Enum.* iv. 338, *non Jacq.*—Eratobotrys, *Fenzl. Endlich. Gen. Mant.* 13; *Kunth, Enum.* iv. 679.—Xeodolon et Sugillaria, *Salisb. Gen.* 18.—Usteria, *Medic. Act. Palat.* vi. 480, *non Cav. nec Willd.*—Endymion, *Dumort. Flor. Belg.* 140.—Agraphis, *Link, Handb.* 166; *Endlich. Gen.* 1123.—Hylomenes, *Salisb. Gen.* 26.—Limonanthe, *Link, Enum.* i. 327.

Perianthium 6-partitum, saturate cæruleum vel roseo-purpureum, raro viridulum vel albidum, laciniis subæqualibus ligulato-lanceolatis, flore expanso patentibus vel tertio vel dimidio inferiore diutine conniventibus, dorso uninervatis, nunquam distincte viridi vittatis. *Stamina* distincte perigyna, subuniseriata vel biseriata, filamentis filiformibus segmentis brevioribus, *antheris* oblongis versatilibus. *Ovarium* sessile vel breviter stipitatum, globosum vel ovoideum, triloculare, ovulis in loculo raro solitariis, sæpe geminatis collateralibus vel pluribus superpositis; *stylus* filiformis rectus; *stigma* capitatum, leviter trisulcatum. *Capsula* membranacea, sessilis vel breviter stipitata, globosa vel ovoidea, loculicide trivalvis, seminibus in loculo solitariis vel paucis parvis oblongis vel globosis exalatis haud compressis, sæpe vix funiculatis, interdum basi arillatis. *Testa* membranacea atro-castanea vel nigra. *Herbæ bulbosæ pleræque humiles foliis sæpissime synanthiis linearibus vel lorato-lanceolatis, floribus numerosis parvis racemosis, pedicellis inarticulatis, bracteis linearibus vel deltoideis solitariis vel geminatis raro obsoletis.*

Subgenus I. EUSCILLA. *Perianthii segmenta e basi patentia. Filamenta e basi imo segmentorum uniseriata.*

Ovula in loculo ovarii solitaria (*Barnardia*, Lindl.).
  Folia 2–3. Capsula turbinata.
    Folia duriuscula 2–3 lin. lata ...... 1. *chinensis.*
    Folia carnoso-herbacea 4–6 lin. lata.. 2. *japonica.*
  Folia 4–6. Capsula globosa.......... 3. *numidica.*
Ovula in loculo geminata (*Prospero*, Salisb.).
  Bracteæ obsoletæ. Folia post anthesin producta.
    Pedicelli 2–4 lin. longi.
      Folia subteretia ½ lin. lata ...... 4. *autumnalis.*
      Folia lineari-lanceolata .... 5. *obtusifolia.*
    Pedicelli 12–21 lin. longi .... 6. *Hanburii.*
  Bracteæ solitariæ. Folia synanthia.
    Parvifloræ. (Perianthium 1–2 lin. longum.)
      Folia carnoso-herbacea glabra venis immersis.
        Folia lanceolata 1½–2½ poll. lata. 7. *latifolia.*
        Folia lorata 6–15 lin. lata.
          Folia 2–3 .... 8. *hæmorrhoidalis.*
          Folia 5–8
            Bracteæ pedicellis æquilongæ
              9. *Bertheloti.*
            Bracteæ minutissimæ ......10. *messenaica.*
        Folia lineari-lorata 2–4 lin. lata. 11. *pratensis.*
      Folia rigide coriacea venis exsculptis.
        Folia pubescentia. Perianthium album.
          12. *Gerrardi.*
        Folia glabra. Perianthium roseo-purpureum.
          13. *firmifolia.*

Perianthium 2–2½ lin. longum. Bracteæ deltoideæ.
14. *hyacinthoides.*
Perianthium 4–5 lin. longum. Bracteæ elongatæ lineares.
15. *Lilio-hyacinthus.*
Bracteæ geminatæ. Folia synanthia (Somera, *Salisb.*).
Folia 2-raro 3 lanceolata ....16. *Aristidis.*
Folia 4–6 lorata elongata*..........17. *italica.*
Ovula in loculo pauca vel plura superposita.
Bracteæ minutæ deltoideæ interdum obsoletæ.
Flores 1–3 subcernui ... .18. *sibirica.*
Flores 3–12 vel ultra erecti.
Folia sæpissime 2 raro 3–4 ......19. *bifolia.*
Folia semper 4–5 ....20. *amœna.*
Bracteæ lineares elongatæ solitariæ.
Species regionis Mediterraneæ et Europæ occidentalis ovario sesssili.
Racemi deltoidei vel subcorymbosi.
Racemi 50–100-flori ....21. *peruviana.*
Racemi 6–15- vel raro 20-flori.
Folia margine ciliata.
Perianthium 3 lin. longum. 22. *Cupani.*
Perianthium 4–4½ lin. longum.
23. *villosa.*
Folia margine glabra ....24. *verna.*
Racemi oblongi.
Folium solitarium ....25. *monophylla.*
Folia 3–4..................26. *odorata.*
Species Capenses, ovario stipitato.
Folia rigide coriacea venis exsculptis.
Perianthium albidum. Bulbus apice setis copiosis coronatus ....27. *rigidifolia.*
Perianthium cæruleum. Bulbus apice setis nullis coronatus ....28. *Krausii.*
Folia carnoso-herbacea venis immersis.
Perianthium cæruleum. Bracteæ 9–12 lin. longæ.
29. *natalensis.*
Perianthium albidum. Bracteæ 2–3 lin. longæ.
Folia lineari-lorata 4–6 lin. lata.
30. *versicolor.*
Folia lanceolato-lorata 12–15 lin. lata.
31. *pallidiflora.*

Bracteæ deltoideæ geminatæ ....32. *Hohenackeri.*
Bracteæ lineares geminatæ.
  Folia linearia 2–3 lin. lata..........33. *vincentina.*
  Folia lingulato-lorata 4–6 lin. lata ..34. *lingulata.*
Species dubiæ hujus subgeneris ...... { 35. *lusitanica.* 36. *plumbea.* 37. *flexuosa.*

Subgenus II. LEDEBOURIA. *Perianthii segmenta basi in cupulam diutine conniventia. Filamenta supra basin segmentorum subuniseriata.*

Parvifloræ. Perianthium 1–1½ vel raro 2 lin. longum, sæpissime rotundato-campanulatum.
 Perianthium intus saturate roseo-purpureum.
  Folia lata basi subpetiolata.
   Racemus densus. Folia ovato-oblonga. 38. *Sandersoni.*
   Racemus laxus. Folia oblanceolata. 39. *revoluta.*
  Folia angusta basi haud angustata.
   Scapi graciles 1–3-pollicares. Racemi oblongi.
    Perianthium rotundato-campanulatum.
     Folia anguste linearia ......40. *minima.*
     Folia lanceolata ....41. *exigua.*
    Perianthium oblongo-campanulatum 42. *Barberi.*
   Scapus firmus 5–6-pollicaris. Racemus cylindricus. 43. *Cooperi.*
 Perianthium viridulum.
  Folia basi petiolata.
   Folia ovato-lanceolata .... 44. *zambesiaca.*
   Folia lorata .... 45. *camerooniana.*
  Folia oblongo-lanceolata tertio inferiore angustata. 46. *prasina.*
  Folia lanceolata basi vix angustata.
   Perianthium rotundato-campanulatum. 47. *Ludwigii.*
   Perianthium oblongo-campanulatum. 48. *mœsta.*
Perianthium 2–3 lin. longum rotundato- vel oblongo-companulatum.
 Folia post scapum producta .... 49. *undulata.*

Folia synanthia.
Racemi foliis eminentes.
Folia petiolata vel subpetiolata. Ovarium basi haud discoideo-productum (Tropicales).
Folia basi supra petiolum rotundata.
50. *Currori*.
Folia in petiolum cuneatim angustata.
Folia geminata opposita ......51. *Richardiana*.
Folia 3–8 rosulata.
Folia obovato-oblonga obtusa.
52. *maculata*.
Folia lanceolato-oblonga acuta.
Perianthium rotundato-campanulatum.
53. *indica*.
Perianthium tubuloso-campanulatum.
54. *lilacina*.
Folia sessilia basi vix angustata.
Perianthium viridulum.
Folia sæpissime 2 opposita .... 55. *paucifolia*.
Folia 3–4 rosulata .... 56. *socialis*.
Perianthium intus roseo-purpureum.
57. *lanceæfolia*.
Folia racemis æquilonga vel eminentia.
Perianthium intus et extus viridulum. Filamenta viridula.
58. *concolor*.
Perianthium intus purpureum filamentis saturate coloratis.
Folia linearia medio 4–9 lin. lata.
Scapus arcuatus 3–4-pollicaris ..59. *linearifolia*.
Scapus erectus 5–6-pollicaris....60. *concinna*.
Folia lorato-lanceolata 10–12 lin. lata.
Folia glauca basi distincte angustata.
61. *subglauca*.
Folia viridia basi vix angustata. 62. *lorata*.
Folia lingulato-lanceolata 18–21 lin. lata basi vix angustata.
63. *zebrina*.
Folia oblonga basi valde spathulatim angustata.
64. *spathulata*.
Grandifloræ. Perianthium oblongo-campanulatum 4–5 lin. longum.
Racemi laxissimi.
Folia distincte petiolata...............65. *Kirkii*.
Folia haud petiolata ....66. *lanceolata*.

Racemi densi
  Pedicelli centrales 6–8 lin. longi ...... 67. *floribunda.*
  Pedicelli centrales 12–15 lin. longi.
    Racemi 30–60-flori pedicellis gracillimis pendulis. 68. *pendula.*
    Racemi 150–200-flori pedicellis validis strictis. 69. *princeps.*
Species haud visa hujus subgeneris ...... 70. *viridiflora.*

Subgenus III. ENDYMION. *Perianthii segmenta dimidio inferiore diutine conniventia. Filamenta supra basin segmentorum inserta distincte biseriata inæqualia.*

Perianthium rotundato-campanulatum .. 71. *hispanica.*
Perianthium tubuloso-campanulatum .. 72. *nonscripta.*

Subgenus I. EUSCILLA, *Baker, in Saund. Ref. Bot.* iii. App. 5.

Perianthium cæruleum, raro purpureum vel albidum, segmentis flore expanso rotatim patentibus. *Filamenta* ex basi segmentorum uniseriata. *Ovarium* sessile, loculis 2- vel pluri- raro uniovulatis. *Bracteæ* lineares solitariæ vel geminatæ vel parvæ deltoideæ raro obsoletæ.—Scilla, sectio α, *Kunth, excl. sp.*—Barnardia, *Lindley.*—Stellaris, *Steinheil.*—Adenoscilla, *Grenier.*—Nectaroscilla, *Parlatore.*—Caloscilla, *Jourd. et Fourr.*—Somera, Basaltogeton, Petranthe, Monocallis, Orthocallis, Rinopodium, et Prospero, *Salisb.*

1. S. CHINENSIS, *Benth. Flor. Hongkong.* 293.—Barnardia scilloides *Lindl. Bot. Reg.* t. 1029; *Hook. Bot. Mag.* t. 3788; *Kunth, Enum.* iv. 337. Bulbus ovoideus 9–12 lin. crassus. Folia synanthia 2–3, scapum æquantia vel superantia, 2–3 lin. lata, duriuscula, multinervata facie canaliculata, acuta. Scapus gracilis pedalis vel ultra, strictus. Racemus subdense 20–60-florus, expansus 1–2 poll. longus, 5–6 lin. latus. Pedicelli diutine ascendentes 1½–2 lin. longi, inferiores sæpe geminati. Bracteæ minutæ albidæ lanceolato-deltoideæ. Perianthium 1 lin. longum roseo-purpureum. Filamenta segmentis paulo breviora. Stylus filiformis vix ¼ lin. longus. Ovula in loculo solitaria. Racemus fructiferus 4–6-pollicaris. Capsula turbinata 1½–2 lin. longa. *China a Pekin ad Macao et Hongkong,* Vachell! Fortune, 144! Dr. Williams! Hance, 291! Champion! etc. Vix *Ornithogalum sinense,* Lour. Coch. 255, planta Cochin-chinensis imperfecte descripta.

2. S. JAPONICA, *Baker.*—Ornithogalum japonicum, *Thunb. Jap.* 137.—Barnardia japonica, *Schultes, fil. Syst.* vii. 555; *Kunth, Enum.* iv. 337. Bulbus ovoideus 9–12 lin. crassus. Folia synanthia 2–3 carnoso-her-

bacea 6–12 poll. longa, 4–6 lin. lata acuta in dimidio inferiore sensim angustata. Scapi 1–3-pedales vel ultra graciles stricti. Racemus sublaxe 20–60-florus vel ultra, fructiferus 4–8 poll. longus pollicem latus. Pedicelli diutine ascendentes, fructiferi 5–6 lin. longi. Bracteæ minutæ lineares albidæ. Perianthium 1½ lin. longum roseo-purpureum. Filamenta basi complanata segmentis paulo breviora. Stylus ½ lin. longus. Ovula in loculo solitaria. Capsula turbinata, profunde trisulcata, 2½–3 lin. longa. *Japonia,* Thunberg, Oldham, 242! 917! 874! Buerger! etc.; *Insulæ Loo Choo,* C. Wright, 331!

3. S. NUMIDICA, *Poir. It. Barb.* ii. 150 (anno 1789).—S. parviflora, *Desf. Fl. Atlant.* i. 300, t. 87; *Schultes, fil. Syst.* vii. 567; *Kunth, Enum.* iv. 315.—Stellaris parviflora, *Steinh. Ann. Sc. Nat.* ser. 2, vi. 286. Bulbus ovoideus 1–2 poll. crassus. Folia 4–6 carnoso-herbacea linearia 6–8 poll. longa, 1½–3 lin. lata suberecta. Scapi solitarii vel bini ½–1-pedales stricti. Racemi subdense 30–60-flori, fructiferi 2–3 poll. longi pollicem lati. Pedicelli diutine ascendentes 3–5 lin. longi. Bracteæ minutissimæ lineares evanescentes. Perianthium roseo-purpureum 1½ lin. longum. Filamenta segmentis paulo breviora basi complanata. Ovula in loculo solitaria. Capsula 1½ lin. longa globosa profunde trisulcata. *Algeria,* Jamin, 115! Lefebvre, 641! Steinheil! Webb! etc.

4. S. AUTUMNALIS, *Linn. Sp.* 443; *Cav. Ic.* t. 274. fig. 2; *Curt. Lond.* t. 25; *Engl. Bot.* t. 78; *Red. Lil.* t. 317; *Bot. Mag.* t. 919; *Kunth, Enum.* iv. 315; *Reich. Ic.* t. 1012. Bulbus ovoideus 6–12 lin. crassus. Folia 5–6 post anthesin matura carnoso-herbacea subteretia facie canaliculata 4–6 poll. longa, ½ lin. lata. Scapi 1–3 flexuosi 2–6-pollicares. Racemi 6–20-flori expansi 1½–2 poll. longi, 6–10 lin. lati. Pedicelli diutine ascendentes, infimi 2–4 lin. longi. Bracteæ obsoletæ. Perianthium roseo-lilacinum 1½–2 lin. longum. Filamenta complanata segmentis subduplo breviora. Ovula in loculo gemina. Capsula globosa 1½ lin. longa profunde trisulcata. Testa nigra. *Ab Anglia ad Tauriam, Algeriam, et Syriam.*—S. DUMETORUM, *Balansa, MSS.* est forma foliis post dehiscentiam capsulæ productis; S. RACEMOSA, *Balansa, Pl. Alg. Exsic.* no. 29, est forma robusta bulbo majore seminibus fuscescentibus; S. PULCHELLA, *Munby, Bull. Bot. Soc. France,* ii. 286! est varietas Algeriensis foliis gracillimis post anthesin maturis demum scapo subæquilongis, racemo 6–8-floro, fructifero vix ultra semipollicem lato, perianthio minore magis campanulato.

5. S. OBTUSIFOLIA, *Poiret, It.* ii. 149; *Desf. Atl.* i. 299, t. 86; *Red. Lil.* t. 190; *Kunth, Enum.* iv. 315. Bulbus ovoideus 12–18 lin. crassus. Folia 3–4 post anthesin matura subcoriacea glabra distincte multinervata lingulato-lanceolata 3–4 poll. longa, 6–12 lin. lata acuta margine incrassata. Scapi 1–4, flexuosi, 6–12 poll. longi, basi rufes-

centes, sæpe puberuli. Racemus subdense 20–60-florus, floriferus 2–3 poll. longus, 9–10 lin. latus. Pedicelli diutine ascendentes, infimi 3–4 lin. longi. Bracteæ obsoletæ. Perianthium roseo-lilacinum 1½–2 lin. longum. Filamenta basi applanata segmentis paulo breviora. Ovula in loculo gemina. Capsula 1½ lin. longa globosa trisulcata. Testa nigra. *Algeria*, Bové! Steinheil! Munby! etc.

Var. *β*. INTERMEDIA, *Baker*.—S. intermedia, *Guss. Prodr.* i. 417; *Kunth, Enum.* iv. 315; *Parl. Fl. Ital.* i. 470.—S. obtusifolia, *Moris, Stirp.* i. 47; *Gren. Flor. Franc.* iii. 185. Gracilior bulbo minore, foliis maturis 15–18 lin. longis, 3–4 lin. latis, racemo laxo 6–15-floro. *Sardinia*, Bonjean! Thomas! Moris! *Corsica*, Serafino!

Var. *γ*. FALLAX, *Baker*.—S. fallax, *Steinheil, Ann. Sc. Nat.* ser. 2, i. 103. Statura et bulbus formæ typicæ sed folia longiora angustiora, matura 5–6 poll. longa, 1½–2 lin. lata. *Algeria*, Steinheil, Webb! etc. *Marocco prope Tangiers*, Salzmann! Forma inter *obtusifoliam* et *autumnalem* medium tenens.

6. S. HANBURII, *Baker*. Bulbus ovoideus 1 poll. crassus. Folia post racemum producta, immatura solum vidi, anguste linearia, carnoso-herbacea. Scapus strictus 3–5-pollicaris. Racemus laxe 15–25-florus 2–3 poll. longus et latus. Bracteæ obsoletæ. Pedicelli infimi demum stricti patentes 12–21 lin. longi, superiores ascendentes. Perianthium 2 lin. longum segmentis anguste ligulatis ½ lin. latis. Filamenta segmentis paulo breviora. Ovula in loculo gemina. Capsula 2 lin. longa obovoidea, trisulcata, obtusa. Stylus filiformis ½ lin. longus. *Antilibanus, alt.* 4000 *pedes*, Hooker fil. et Hanbury!

7. S. LATIFOLIA, *Willd. Herb.* no. 6618; *Schultes fil. Syst. Veg.* vii. 566; *Kunth, Enum.* iv. 322.—S. iridifolia, *Webb, Phyt. Can.* iii. 338, t. 233. Bulbus ovoideus, 1½–2 poll. crassus. Folia 6–9 basin scapi longe involventia lanceolata tenuiter carnoso-herbacea, 12–15 poll. longa, medio 1½–2½ poll. lata, ad basin et apicem sensim angustata margine glabra, venis permultis gracillimis immersis. Scapus strictus pedalis et ultra. Racemus dense 30–60-florus expansus 3–4 poll. longus, 12–15 lin. latus. Pedicelli infimi subpatentes 5–7 lin. longi. Bracteæ minutissimæ lineari-subulatæ. Perianthium lilacinum campanulatum 1½ lin. longum segmentis ligulatis ½ lin. latis. Ovula in loculo geminata. Filamenta segmentis paulo breviora. Capsulam non vidi. *Insulæ Canarienses*, Broussonet. *Madeira*, Lowe! Mandon!—S. LUSITANICA, *Sims, Bot. Mag.* t. 1999, non *Linn.*, est verisimiliter forma robusta hortensis.

8. S. HÆMORRHOIDALIS, *Webb, Phyt. Can.* iii. 336, t. 230.—S. dasyantha, *Webb, Phyt. Can.* iii. 337, t. 231.—S. hyacinthoides, *Bourg. Can. Exsic.* no. 30, non *Linn.* Bulbus ovoideus 12–15 lin. crassus tunicis pluribus fuscis membranaceis. Folia 2–3 synanthia lorata tenuiter

carnoso-herbacea 6–12 poll. longa, 6–15 lin. lata apice cito basi longe angustata margine glabra venis gracilibus immersis. Scapus 4–9-pollicaris. Racemus 20–50-florus, expansus 4–8 poll. longus, 8–12 lin. latus. Bracteæ lineari-subulatæ 1–1½ lin. longæ. Pedicelli erecto-patentes, infimi 2–3 lin. longi. Perianthium campanulatum lilacinum 1½ lin. longum segmentis ligulatis apice puberulis. Filamenta vix 1 lin. longa. Ovula in loculo 2. Capsula 2 lin. longa depresso-globosa, obtuse trigona. *Insulæ Canarienses,* Webb! Bourgeau, 30! 1534! etc.

9. S. Bertheloti, *Webb, Phyt. Can.* iii. 337, t. 232; *Hook. fil. Bot. Mag.* t. 5308. Bulbus longe ovoideus 6–9 lin. crassus. Folia 5–6 synanthia tenuiter carnoso-herbacea patentia lorata 6–12 poll. longa medio 6–9 lin. lata apice cito basi longe attenuata, venis gracilibus immersis. Scapi graciles 6–8-pollicares. Racemi 12–20-flori expansi 1–2 poll. longi, 5–6 lin. lati. Bracteæ subulatæ 1 lin. longæ. Pedicelli ascendentes bracteis æquilongi. Perianthium campanulatum pallide lilacinum 1 lin. longum segmentis ligulato-lanceolatis. Filamenta segmentis paulo breviora. Ovula in loculo bina collateralia. Stylus filiformis ovario æquilongus. Capsula globosa obtuse trigona. *Insulæ Canarienses,* Berthelot. *Guinea occidentalis,* Barter legit, floruit in hort. Kew. anno 1860.

10. S. messeniaca, *Boiss. Diagn.* vii. 110; *Walp. Ann.* i. 856.—S. amœna, *Bory et Chaub. Fl. Pelop. non aliorum.* Bulbus ovoideus tunicis pallidis. Folia 5–7 lorata 12–18 poll. longa, 4–10 lin. lata 24–36-nervata apice cito basi longe attenuata. Scapus gracilis foliis subæquilongus. Racemus 7–12-florus ovato-oblongus. Bracteæ lineares solitariæ minutissimæ. Pedicelli erecto-patentes floribus sesquilongiores. Perianthii segmenta linearia obtusa pallide azurea linea media saturatiore notata. Filamenta cærulea basi applanata. Ovula in loculo gemina. Stylus ovario æquilongus. *Græcia, Peloponnesus,* Bory et Chaubard (non vidi).

11. S. pratensis, *W. & K. Hung.* ii. 207, t. 189; *Lindl. Bot. Reg.* 1839, t. 63; *Kunth, Enum.* iv. 316; *Reich. Icones,* t. 463.—S. amethystina, *Viviani, Fl. Dalm.* t. 4. Bulbus ovoideus 9–12 lin. crassus. Folia 3–6 carnoso-herbacea glabra synanthia anguste ligulata 6–12 poll. longa nervis immersis 10–20, 2–4 lin. lata, e medio ad apicem et basin sensim attenuata. Racemus dense 12–30-florus, expansus floriferus 1½–2½ poll. longus, 15–18 lin. latus. Bracteæ minutissimæ, deltoideæ, solitariæ. Pedicelli 4–6 lin. longi ascendentes vel subpatentes. Perianthium campanulatum 1½–2 lin. longum saturate cæruleum segmentis ½ lin. latis. Filamenta 1–1½ lin. longa deorsum applanata. Ovula in loculo gemina. Stylus ½ lin. longus. Capsula globosa. *Croatia, Bosnia, Dalmatia.*

12. S. Gerrardi, *Baker*. Bulbus ovoideus 8–9 lin. crassus apice fibris brunneis copiosis persistentibus setosis coronatus. Folia 3–4 synanthia linearia ascendentia 3–5 poll. longa, 1–1½ lin. lata undulata ubique griseo-pubescentia rigide coriacea persistentia marginibus incrassatis faciebus nervis 5–6 valde exsculptis instructis. Scapus pubescens strictus 4–6-pollicaris. Racemus subdense 20–50-florus expansus 2–3 poll. longus, 18–21 lin. latus. Bracteæ solitariæ lineari-subulatæ 1½–2 lin. longæ. Pedicelli ascendentes validi 6–9 lin. longi. Perianthium album 1½ lin. longum segmentis ½ lin. latis apice obtusiusculis leviter cucullatis. Filamenta 1 lin. longa basi linearia. Capsula depresso-globosa profunde trigona 1 lin. longa seminibus in loculo solitariis. *Natalia*, Gerrard, 1829! *Kaffraria Britannica*, Mrs. Hutton!

13. S. firmifolia, *Baker in Saund. Ref. Bot.* iii. App. 7. Bulbus ovoideus 12–15 lin. crassus. Folia synanthia 3–4 rigide coriacea glabra suberecta linearia 5–6 poll. longa 1½–2 lin. lata dorso convexa facie canaliculata venis valde exsculptis. Scapi firmi 5–6-pollicares. Racemi subdense 30–50-flori expansi cylindrico-lanceolati 3–4 poll. longi, 6–7 lin. lati. Bracteæ lineari-lanceolatæ ½–1 lin. vel infimi 1½–2 lin. longæ. Pedicelli ascendentes inferiores 1½–2 lin. longi. Perianthium rotundato-campanulatum saturate roseo-purpureum, 1½ lin. longum segmentis lanceolatis ½ lin. latis. Ovula in loculo 2. Filamenta 1 lin. longa basi lanceolata. *Cap. B. Spei*, Drege, 4492! MacOwan, 461!

14. S. hyacinthoides, *Linn. Syst. Veg.* xiii. 272; *Bot. Mag.* t. 1140; *Künth, Enum.* iv. 316; *Reich. Ic.* t. 1016.—Nectaroscilla hyacinthoides, *Parlat. Nuov. Gen.* 27.—Prospero hyacithoideum, *Salisb Gen.* 28.—Scilla eriophora, *Mill. Dict.* no. 10. Bulbi magni gregarii ovoidei 1½–2 poll. crassi. Folia 10–12 synanthia carnoso-herbacea patentia 12–18 poll. longa, 6–15 lin. lata basi longe apice cito angustata margine minute ciliato-denticulata. Scapus strictus 1–2-pedalis vel ultra. Racemus 50–150-florus expansus 6–18 poll. longus, 2–2½ poll. latus. Bracteæ minutæ deltoideæ albidæ persistentes. Pedicelli erecto-patentes, inferiores 12–15 lin. longi. Perianthium saturate lilacino-cæruleum, 2–2½ lin. longum, segmentis ligulatis apice puberulis. Filamenta 1½–2 lin. longa deorsum applanata. Ovula in loculo gemina collateralia. Stylus filiformis 1½ lin. longus. Capsula globosa. *Ex Lusitania per regionem mediterraneam ad Syriam.*

15. S. Lilio-hyacinthus, *Linn. Sp. Plant.* 442; *Red. Lil.* t. 205; *DC. Flor. Franc.* iii. 213; *Kunth, Enum.* iv. 328.—Ornithogalum squamosum, *Lam. Gall.* iii. 274. Bulbus ovoideus 15–18 lin. crassus, squamis latis ovatis liliaceis vestitus. Folia 4–6 synanthia carnoso-herbacea flaccida glabra basin scapi longe involventia 6–12 poll longa, 8–12 lin. lata apice cito deorsum sensim angustata. Scapus gracilis

6–12-pollicaris. Racemi 6–18-flori expansi 2–3 poll. longi, 15–18 lin. lati. Pedicelli erecto-patentes, infimi 6–12 lin. longi. Bracteæ lineares solitariæ persistentes 6–9 lin. longæ. Perianthium campanulatum saturate cæruleum 4–5 lin. longum segmentis lanceolatis 1–1½ lin. latis. Ovula in loculo gemina. Filamenta 2½–3 lin. longa. Stylus 2 lin. longus. Capsula depresso-globosa 4 lin. longa et lata obtuse trigona. *Gallia centralis et meridionalis. Hispania borealis.*

16. S. ARISTIDIS, *Cosson, Bull. Soc. Bot. France,* v. 104. Bulbus ovoideus 5–6 lin. crassus. Folia 2–3 synanthia carnoso-herbacea glabra lanceolata acuta 5–6 poll. longa, 4–6 lin. lata basin scapi amplectentia. Scapus solitarius foliis paulo longior. Racemus dense 10–12-florus expansus 12–15 lin. longus, 5–6 lin. latus. Bracteæ geminatæ lineares albidæ 3–4 lin. longæ. Pedicelli ascendentes, infimi 2–3 lin. longi. Perianthium 2½–3 lin. longum segmentis vix 1 lin. latis. Filamenta 1½ lin. longa. Ovula in loculo geminata. Stylus 1 lin. longus. *Algeria,* Letourneux! Habitus omnino *S. lingulatæ,* sed facile distinguitur foliis paucis, ovulis geminatis.

17. S. ITALICA, *Linn. Sp. Plant.* 442 (ex parte) non *Linn. Herb.*; *Bot. Mag.* t. 663; *Red. Lil.* t. 304; *Lodd. Bot. Cab.* t. 1483; *Kunth, Enum.* iv. 323; *Reich. Icones,* t. 1013.—Somera italica, *Salisb. Gen.* 26.—S. purpurea, *Mill. Dict.* no. 9; *Kunth, Enum.* iv. 331.—S. Bertolonii, *Duby, Bot. Gall.* i. 465.—Bulbus ovoideus 6–9 lin. crassus. Folia 4–6 lorata carnoso-herbacea flaccida patentia acute carinata 4–8 poll. longa, 3–6 lin. lata apice cito deorsum sensim angustata. Scapi solitarii graciles 6–10-pollicares. Racemi dense 6–30-flori primum conici expansi 1–2 poll. longi, 9–12 lin. lati. Bracteæ binæ, lineares, 4–6 lin. longæ. Pedicelli erecto-patentes, infimi 3–6 lin. longi. Perianthium saturate cæruleum odore salicum 2½–3 lin. longum segmentis ½ lin. latis apice puberulis. Filamenta 1½–2 lin. longa basi anguste cuneata. Ovula in loculo 2. Capsula globosa obtuse trigona. *Italia, Helvetia, Baden, Gallia meridionalis.* S. purpurea, *Mill.,* est forma robusta hortensis floribus saturatioribus. S. byzantina, *Poir. Enc.* vi. 739; *Kunth, Enum.* iv. 330, ex descriptione non potui separare.

18. S. SIBIRICA, *Andrews, Bot. Rep.* t. 365; *Lodd. Bot. Cab.* t. 151; *Kunth, Enum.* iv. 318; *Masters, Gard. Chron.* 1868, 516.—S. amœna, *Red. Lil.* t. 130, non *Linn.*—S. cernua, *Red. Lil.* sub t. 298; *M. Bieb. Taur.* iii. 266; *Led. Fl. Ross.* iv. 157, non *Hoffm. et Link.*—S. uniflora, *Willd. herb.* no. 6624.—S. amœnula, *Hornem. Hort. Hafn.* i. 331; *Bot. Mag.* t. 2408.—S. amœna, β sibirica, *Bot. Mag.* t. 1025.—S. azurea, *Goldm. Mém. Soc. Nat. Mosc.* v. 125; *Walp. Ann.* i. 857.—Othocallis sibirica, *Salisb. Gen.* 28.—S. Roseni, *C. Koch, Linn.* xxii. 250.—S. monanthos, *C. Koch, Linn.* xxii. 251.—S. xanthandra, *C. Koch, Linn.* xxii. 250? Bulbus globosus 6–15

lin. crassus. Folia 2–4 synanthia carnoso-herbacea ascendentia anguste lorata demum 4–6 poll. longa, 4–6 lin. lata apice cito angustata leviter cucullata deorsum sensim attenuata venis 12–20 immersis. Scapi 1–6 carnosi 3–6-pollicares. Flores 1–3 horizontales vel subcernui laterales breviter pedicellati. Bracteæ minutæ deltoideæ. Perianthium fulgide cæruleum 6–7 lin. longum segmentis $1\frac{1}{2}$–2 lin. latis flore expanso ascendentibus, dorso saturatioribus. Filamenta 3–$3\frac{1}{2}$ lin. longa basi complanata. Ovula in loculo 8–10. Stylus $1\frac{1}{2}$–2 lin. longus. *Rossia europæa meridionalis et media ad Armeniam, Georgiam et Kurdistan.*

19. S. BIFOLIA, *Linn. Sp. Plant.* 443; *Jacq. Austr.* t. 117; *Bot. Mag.* t. 746; *Eng. Bot.* t. 24; *Red. Lil.* t. 254; *Reich. Icones,* t. 1015; *Masters, Gard. Chron.* 1868, 516, 1869, 473.—Adenoscilla bifolia, *Gren. Fl. France,* iii. 187.—Rinopodium bifolium, *Salisb. Gen.* 29.—Scilla dubia, *C. Koch, Linnæa,* xix. 315; *Walp. Ann.* i. 856.—Bulbus ovoideus 6–9 lin. crassus. Folia synanthia sæpissime bina opposita basin scapi longe amplectentia carnoso-herbacea apice cito angustata cucullata deorsum sensim attenuata matura 4–8 poll. longa, 4–6 lin. lata, facie concava. Scapi solitarii 3–6-pollicares. Racemi deltoidei 3–8-flori expansi 1–$1\frac{1}{2}$ poll. lati pedicellis ascendentibus, infimis 6–12 lin. longis. Bracteæ minutæ deltoideæ interdum obsoletæ. Perianthium saturate cæruleum, interdum rubellum vel albidum, 4–5 lin. longum, segmentis 1–$1\frac{1}{4}$ lin. latis flore expanso patentibus. Filamenta $2\frac{1}{2}$–3 lin. longa basi complanata. Ovula in loculo 5–6. Stylus 1 lin. longus. Capsula globosa 3–4 lin. longa et lata, obtuse trigona, seminibus in loculo 2–4 fuscescentibus basi arillo albido carnoso conspicuo præditis. *Ex Hispania et Gallia ad Asiam minorem et Georgiam.* S. KLADNII, *Schur, Transyl.* 668, est forma bifolia parva alpina decumbens pauciflora. De formis cultis cf. Masters loc. cit.

Var. *β.* PRÆCOX, *Masters, loc. cit.*—S. præcox, *Sweet. Brit. Flow. Gard.* ser. 2, t. 141; *Schott. Bot. Zeit.* 1851, 283. Robustior, bulbo ovideo pollicem crasso, floribus 10–15 præcocioribus paulo majoribus, pedicellis infimis 1–$1\frac{1}{2}$ poll. longis, foliis crassioribus latioribus. *Austria etc.* S. ROSEA, *Lehm. Ind. Sem.* 1828, 17; *Kunth, Enum.* iv. 317, est forma hujus varietatis floribus rubellis. S. BIFOLIA, var. TAURICA, *Regel, Gartenfl.* 1860, t. 307, est forma taurica foliis 3–4 sæpissime prædita.

Var. *γ.* NIVALIS, *Baker.*—S. nivalis, *Boiss. Diagn.* v. 63; *Walp. Ann.* i. 856.—Adenoscilla nivalis, *J. Gay in Balans. Pl. Orient.* no. 1321.—Scilla minor, *C. Koch, Linnæa,* xix. 9; *Walp. Ann.* i. 857.—S. alpina, *Schur, Transyl.* 668. Gracilior foliis binis 2–3 lin. latis, floribus 2–5 minoribus segmentis vix ultra 3 lin. longis. *Montes Græciæ, Asiæ Minoris, etc.* S. LAXA et SUBTRIPHYLLA, *Schur, Transyl.* 668, sunt formæ affines ex montibus Transylvaniæ foliis sæpissime 3–5 præditæ.

20. S. AMŒNA, *Linn. Sp. Plant.* 443; *Jacq. Austr.* t. 218; *Bot. Mag.* t. 341; *Red. Lil.* t. 298; *Bot. Cab.* t. 1015; *Kunth, Enum.* iv. 317; *Reich. Icones,* t. 1014; *Masters, Gard. Chron.* 1868, 516.—Othocallis amœna, *Salisb. Gen.* 28. Bulbus subglobosus 6–9 lin. crassus. Folia 4–5 synanthia carnoso-herbacea flaccida lorata basin scapi amplectentia ascendentia glabra 6–9 poll. longa, 4–8 lin. lata apice cito deorsum longe angustata venis 20–30 gracilibus immersis. Scapus debilis 4–6-pollicaris. Racemus laxe 3–6-florus, expansus 1–3 poll. longus. Bracteæ minutæ deltoideæ. Pedicelli ascendentes, infimi 6–9 lin. longi. Perianthium 5–6 lin. longum saturate cæruleum raro albidum segmentis lanceolatis 1–1½ lin. latis. Filamenta 3 lin. longa basi complanata. Ovula in loculo 6–8. Stylus cæruleus 1½–2 lin. longus. Capsula subglobosa, obtuse trigona sulcis parum profundis. *Austria, Germania, Italia borealis.*

Var. β. BITHYNICA, *Baker.*—S. bithynica, *Boiss. Diagn.* vii. 110; *Walp. Ann.* i. 856. Gracilior foliis 3–4 lin. latis 10–15-nervatis perianthio 3 lin. longo. *Montes Asiæ Minoris,* Aucher Eloy, 5393! Kotschy, Plantæ Cilicico-Kurdicæ, suppl. no. 52!

21. S. PERUVIANA, *Linn. Sp. Plant.* 442; *Red. Lil.* t. 167; *Bot. Mag.* t. 749; *Kunth, Enum.* iv. 318; *Reich. Ic.* t. 1017.—Basaltogeton peruvianum, *Salisb. Gen.* 27.—S. comata, *Hoffmansegg.*—S. hemisphærica, *Boiss. Voy. Esp.* 63.—S. sicula, *Tineo in Guss. Fl. Sic.* ii. 813; *Parl. Fl. Ital.* i. 461.—S. candida, *Guss. Fl. Sic.* ii. 814.—S. Vivianii, *Bert. Fl. Ital.* x. 517.—S. elongata, *Parl. Nuov. Gen.* 24; *Fl. Ital.* i. 464; *Walp. Ann.* v. 26.—Caloscilla hipponensis, subcarnea, elegans, venusta, grandiflora, pallidiflora, flaveola, et subalbida, *Jourd. et Fourr. Icones,* t. 247–255. Bulbus ovoideus 2–3 poll. crassus copiose tunicatus. Folia 6–9 synanthia lorata carnoso-herbacea 6–12 poll. longa, 8–12 lin. lata e medio ad basin et apicem angustata margine setis albidis minutis densis ciliata. Scapus robustus striatus 6–12-pollicaris. Racemus densissimus 50–100-florus vel ultra primum deltoideus expansus 4–6 poll. longus et latus. Bracteæ lineares albidæ persistentes solitariæ 1–2 poll. longæ ante anthesin conspicue protusæ. Pedicelli inferiores subpatentes 2–3 poll. longi. Perianthium 5–6 lin. longum lilacinum rubellum vel albidum segmentis lanceolatis viridi vittatis 1½–2 lin. latis. Ovula in loculo 4–6. Filamenta lanceolata 3–4 lin. longa. Capsula turbinata. *Sardinia, Corsica, Sicilia, Italia, Algeria.* Caloscilla hipponensis, subcarnea et elegans, *Jourd. et Four.*, sunt formæ Algerienses floribus rubellis et *C. pallidiflora, flaveola, et subalbida,* floribus albidis.

Var. β. GLABRA, *Boiss. Voy. Esp.* 63.—Scilla Clusii, *Parl. Fl. Ital.* i. 462.—Caloscilla Clusii, *Jord. et Four. Ic.* t. 245. Folia margine glabra. Pedicelli inferiores 1½–2 poll. longi. Perianthium saturate lilacinum. *Hispania, Lusitania, et Mauritania.*—SCILLA HUGHII, *Tineo in Guss. Prodr. Fl. Sic.* 162; *Parl. Fl. Ital.* i. 648; Caloscilla Hughii, *Jord. et Four. Ic.* t. 246, ex insula Maretinio prope Siciliam, est forma robustior, scapo pedicellis et bracteis rubro tinctis, foliis 1½–2 poll. latis.

22. S. CUPANI, *Guss. Prodr.* i. 416; *Bot. Reg.* t. 1878; *Parl. Fl. Ital.* i. 467.—S. Cupaniana, *Schultes fil. Syst. Veg.* vii. 559; *Kunth, Enum.* iv. 319. Bulbus ovoideus 9–12 lin. crassus. Folia 6–8 synanthia lorato-lanceolata carnoso-herbacea patentia 3–4 poll. longa medio 6–8 lin. lata margine pellucida minute ciliata. Scapus gracilis flexuosus 3–6-pollicaris. Racemus laxe 6–12-florus subcorymbosus vel deltoideus expansus 1½–2 poll. longus et latus. Bracteæ albidæ ciliolatæ lanceolatæ solitariæ acuminatæ 6–9 lin. longæ. Pedicelli ascendentes, infimi 1–2 poll. longi. Perianthium saturate cæruleum 3 lin. longum segmentis oblongis obtusis 1 lin. latis. Filamenta 1½ lin. longa basi applanata. Ovula pauca superposita. Capsula obovoidea obtuse trigona. *Sicilia.*

23. S. VILLOSA, *Desf. Fl. Atlant.* i. 299, t. 85. fig. 2; *Graham, Bot. Mag.* t. 3211; *Kunth, Enum.* iv. 319.—S. hirsuta, *Willd. herb.* no. 6635. Bulbus ovoideus 8–9 lin. crassus. Folia 3–4 synanthia lorata carnoso-herbacea patentia 3–5 poll. longa, 3–6 lin. lata, ciliata, facie leviter pilosa, deorsum canaliculata. Scapus 2–3-pollicaris. Racemus subcorymbosus 6–8-florus. Bracteæ solitariæ lineares persistentes 6–9 lin. longæ. Pedicelli erecto-patentes, infimi 9–15 lin. longi. Perianthium saturate cæruleum 4–4½ lin. longum segmentis 1½ lin. latis ellipticis obtusiusculis. Filamenta 2½–3 lin. longa. Ovula in loculo 4–5. *Barbaria.*

24. S. VERNA, *Huds. Fl. Angl.* 142; *Eng. Bot.* t. 23; *Kunth, Enum.* iv. 319; *Reich. Icones,* t. 1010 bis.—S. bifolia, *Fl. Dan.* t. 568, non *Linn.*—Petranthe verna, *Salisb. Gen.* 27.—S. umbellata, *Ramond, Bull. Phil.* xli. 130, t. 8; *Red. Lil.* t. 166 Bulbus ovoideus 6–9 lin. crassus. Folia 4–6 carnoso-herbacea flaccida synanthia patentia glabra linearia 3–8 poll. longa, 1–1½ lin. lata, subobtusa, deorsum sensim angustata. Scapus gracilis 3–6-pollicaris. Racemus 6–12-florus subcorymbosus vel deltoideus, expansus 9–18 lin. latus. Bracteæ solitariæ lineares albidæ 3–6 lin. longæ. Pedicelli erecto-patentes infimi 6–12 lin. longi. Perianthium campanulatum saturate cæruleum 2½–3 lin. longum segmentis lanceolatis 1–1½ lin. latis. Ovula in loculo 4–6. Filamenta lanceolata 2 lin. longa. Capsula globoso-turbinata 2½–3 lin. longa et lata. *Ex insulis Feroe et Hibernia per Angliam et Galliam ad Hispaniam borealem.*

Var. β. RAMBUREI, *Baker.*—S. Ramburei, *Boiss. Elench.* 86; *Voy. Esp.*

750; *Willk. et Lange, Flora,* i. 214.—S. italica, *Linn. herb*! Robustior foliis 2–3 lin. latis floribus sæpe 12–20 magis racemosis. *Hispania,* Rambur! Bourgeau, 473! *Lusitania,* Welwitsch, 378!

25. S. MONOPHYLLA, *Link in Schrad. Journ.* 1799, iv. 319; *Willk. et Lange, Flora,* i. 214.—S. tingitana, *Schousb. Maroc.* i. 155; *Kunth, Enum.* iv. 321.—S. pumila, *Brotero, Lus.* i. 527; *Bot. Mag.* t. 3023; *Kunth, Enum.* iv. 320. Bulbus globosus 6–9 lin. crassus. Folium sæpissime solitarium basin scapi longe involvens ascendens loratum carnoso-herbaceum 6–9 lin. longum, medio 6–8 lin. latum, ad apicem acutum sensim attenuatum. Scapus gracilis 6–12-pollicaris. Racemi laxe 5–20-flori, expansi 2–3 poll. longi, 15–18 lin. lati. Bracteæ 2–3 lin. longæ lineares acuminatæ solitariæ albidæ. Pedicelli ascendentes, infimi 6–12 lin. longi. Perianthium campanulatum 3–4 lin. longum segmentis 1–1½ lin. latis. Ovula in loculo 4–6. Filamenta 2–2½ lin. longa basi complanata. Capsula globoso-turbinata obtuse trigona 4 lin. longa et lata. *Hispania, Lusitania, Mauritania.*

26. S. ODORATA, *Hoffm. et Link, Abh. Berl. Ges.* iv. 21; *Kunth, Enum.* iv. 322; *Willk. et Lange, Flora Hisp.* i. 213. Bulbus ovoideus 6–9 lin. crassus. Folia 3–4 synanthia carnoso-herbacea glabra 6–9 poll. longa, 3–4 lin. lata, subobtusa, facie canaliculata, deorsum longe angustata. Scapus gracilis flexuosus 3–6-pollicaris. Racemi laxe 6–20-flori expansi 1–2½ poll. longi, 15–18 lin. lati. Bracteæ 6–9 lin. longæ solitariæ basi deltoideæ. Pedicelli ascendentes, infimi 4–6 lin. longi. Perianthium campanulatum odorum saturate cæruleum 4–4½ lin. longum segmentis oblongis 1½ lin. latis. Ovula in loculo 5–6. Filamenta 3 lin. longa basi complanata. Capsula globosa obtuse trigona. *Hispania et Lusitania.*

27. S. RIGIDIFOLIA, *Kunth, Enum.* iv. 330. Bulbus ovoideus 1–2 poll. crassus setis copiosis fibrosis persistentibus coronatus. Folia 5–6 synanthia rigide coriacea ascendentia lorato-lanceolata undulata glabra marginibus incrassatis venis valde exsculptis, 8–12 poll. longa, medio 6–12 lin. lata ad apicem acutum sensim angustata. Scapus strictus 6–12-pollicaris. Racemus dense 30–100-florus vel ultra, primum conicus expansus 3–6 poll. longus, 1½–2 poll. latus. Bracteæ lineares 2–3 lin. longæ. Pedicelli validi ascendentes, inferiores 9–18 lin. longi. Perianthium albidum campanulatum 1½–2 lin. longum segmentis oblongis leviter cucullatis ½ lin. latis. Filamenta 1–1½ lin. longa vix applanata. Ovula in loculo 6–8. Ovarium globosum breviter stipitatum. Stylus ovario æquilongus. *Cap. B. Spei,* Bowie (anno 1813), Drège, 4506! Burchell, 2663! MacOwan, 214! etc. *Kaffraria,* Mrs. Hutton! *Natalia,* Plant! *In ditione Transvaal et terra Basuto,* Sanderson! *Ad ripas fluminis Aapages,* Burke!

Var. *β.* NERVOSA, *Baker.*—Ornithogalum nervosum, *Burchell in Roem.*

et Schult. Syst. Veg. vii. 536 (nomen solum). Robustior elatior, racemo ovoideo expanso 7–8 poll. longo, 4–5 poll. lato, pedicellis strictis horizontaliter patentibus 2–2½ poll. longis. *Cap. B. Spei*, Burchell, 2337-2! *In hort. Kew. anno* 1858 *culta*!

28. S. KRAUSSII, *Baker.* Bulbus elongato-ovoideus 9–12 lin. crassu apice setis nullis coronatus. Folia 3–4 synanthia rigide coriacea undique dense pubescentia undulata lanceolata 1½–2 poll. longa, 5–6 lin. lata marginibus incrassatis et venis exsculptis. Scapus firmus 6–8-pollicaris. Racemus dense 20–50-florus 1½–3 poll. longus, circiter pollicem latus. Bracteæ solitariæ lineari-subulatæ 3–4 lin. longæ. Pedicelli graciles ascendentes inferiores 4–6 lin. longi. Perianthium campanulatum cæruleum 1½–2 lin. longum segmentis lanceolatis obtusiusculis ¾ lin. latis. Ovarium globosum brevissime stipitatum ovulis in loculo paucis superpositis. Stylus filiformis ovario æquilongus. Filamenta 1 lin. longa basi applanata. *Natalia*, Krauss, 444! Gerrard, 740!

29. S. NATALENSIS, *Planch. in Bot. Mag.* t. 5379; *Flore des Serres*, t. 1043. Bulbus ovoideus 3–4 poll. crassus apice squamoso-tunicatus fibris nullis. Folia 4–6 carnoso-herbacea synanthia lorato-lanceolata saturate viridia glabra 9–12 poll. longa, 3–4 poll. lata ascendentia ad apicem acutum sensim angustata. Scapus validus erectus teres 4–6 lin. crassus pedalis vel sesquipedalis. Racemus dense 50–100-florus vel ultra expansus 6–12 poll. longus, 2½–3 poll. latus. Pedicelli ascendentes, inferiores 9–12 lin. longi. Bracteæ solitariæ lineari-subulatæ 9–12 lin. longæ. Perianthium saturate cæruleum 3–4 lin. longum segmentis stellatim patentibus 1–1¼ lin. latis. Filamenta linearia 2–2½ lin. longa. Ovarium globosum breviter stipitatum ovulis in loculo 10–12. Stylus filiformis 1 lin. longus. *Natalia*, MacKen! (*v. v. in hort. Kew. etc.*).

Var. *β.* SORDIDA, *Baker.* Minor foliis brunneo tinctis 7–8 poll. longis 15–18 lin. latis, scapo graciliore, floribus paucioribus minoribus, perianthio 2½–3 lin. longo. *Natalia, v. v. in hort. Kew.*

30. S. VERSICOLOR, *Baker in Saund. Ref. Bot.* t. 305. Bulbus ovoideus 1–1½ poll. crassus apice tunicatus. Folia 6–8 synanthia carnoso-herbacea glabra ascendentia lineari-lorata 6–9 poll. longa, 4–6 lin. lata utrinque viridia ad apicem acutum sensim angustata. Scapus erectus 6–8-pollicaris. Racemus subdense 50–80-florus expansus 6–8 poll. longus, 3½ poll. latus rachi incrassato. Bracteæ solitariæ lineares 2–3 lin. longæ. Pedicelli inferiores demum patentes 1½–2 poll. longi. Perianthium 2–2½ lin. longum albidum viridi tinctum segmentis ligulatis obtusiusculis ½ lin. latis. Filamenta 1½–2 lin. longa leviter applanata, antheris cæruleis. Ovula in loculo 5–6. Ovarium globosum cæruleum brevissime stipitatum. Stylus ovario æquilongus. *Cap. B. Spei*, Cooper! (*v. v. in horto Saundersii*).

31. S. PALLIDIFORA, *Baker in Saund. Ref. Bot.* t. 179. Bulbus ovoideus 3–4 poll. crassus tunicis exterioribus apice haud setoso-fibrosis. Folia 5–6 synanthia carnoso-herbacea lorato-lanceolata ascendentia 12–15 poll. longa, 12–15 lin. lata glabra viridia venis immersis. Scapus validus erectus sesquipedalis vel ultra. Racemus dense 100–150-florus vel ultra primum conicus expansus 6–10 poll. longus, 3 poll. latus. Bracteæ solitariæ lineares parvæ. Pedicelli stricti, inferiores horizontaliter patentes 12–15 lin. longi. Perianthium campanulatum albidum viridi tinctum segmentis oblongis obtusiusculis. Filamenta filiformia $1\frac{1}{2}$ lin. longa. Ovarium globosum brevissime stipitatum ovulis in loculo pluribus superpositis. Stylus ovario subæquilongus. *Cap. B. Spei,* Cooper in hort. Saundersii.

32. S. HOHENACKERI, *Fisch. et Mey. in Hohen. Enum. Talusch,* 36; *C. Koch, App. Ind. Sem. Berol.* 1855, 11; *Linnæa,* xxii. 251; *Walp. Ann.* v. 26.—S. cernua β. pluriflora, *Ledeb. Flor. Rossica,* iv. 157. Bulbus ovoideus 6–12 lin. crassus. Folia 4–6 synanthia carnoso-herbacea flaccida glabra anguste lorata 8–12 poll. longa, $1\frac{1}{2}$–3 lin. lata, apice cito, deorsum sensim angustata. Scapi 1–2 graciles 4–8-pollicares. Racemi laxe 6–15-flori expansi 2–3 poll. longi, 15–18 lin. lati. Bracteæ geminatæ albidæ membranaceæ $\frac{1}{2}$ lin. longæ truncatæ basi calcaratæ. Pedicelli subpatentes vel cernui infimi 5–6 lin. longi. Perianthium cæruleum 5–6 lin. longum segmentis ligulatis $1\frac{1}{2}$ lin. latis apice subobtusis leviter cucullatis. Filamenta filiformia 3–4 lin. longa. Ovarium globosum brevissime stipitatum. Stylus filiformis 2 lin. longus. Capsula subglobosa 3 lin. longa seminibus in loculo 3–4. *Caucasus,* Hohenhacker! *Afghanistan,* Griffith, 5805! *India orientalis* (*Margullee Pass, Punjaub*), Vicary!

33. S. VINCENTINA, *Hoffm. et Link, N. Schr. d. Ges. naturf. Berl.* iv. 17; *Kunth, Enum.* iv. 323.—S. mauritanica, *Schousb. Maroc.* i. 154; *Kunth, Enum.* iv. 324. Bulbus subglobosus 6–9 lin. crassus. Folia 3–4 carnoso-herbacea flaccida glabra linearia basin scapi involventia ascendentia 4–8 poll. longa, 2–3 lin. lata ad apicem acutum sensim attenuata. Scapus gracilis 4–6-pollicaris. Racemi 6–18-flori, in formis paucifloris subcorymbosi. Bracteæ lineares geminatæ, inferiores 6–9 lin. longæ. Pedicelli ascendentes, infimi 6–9 lin. longi. Perianthium campanulatum saturate cæruleum, $2\frac{1}{2}$–3 lin. longum, segmentis lanceolatis 1 lin. latis. Filamenta lanceolata $1\frac{1}{2}$–2 lin. longa. Ovula in loculo 4–5. *Lusitania,* Welwitsch, 382! Sir W. C. Trevelyan! *Mauritania,* Salzmann! Habitus omnino *S. vernæ,* sed distinguitur bracteis geminis et forma foliorum.

34. S. LINGULATA, *Poiret, It. Barb.* ii. 151; *Red. Lil.* t. 321; *Desf. Atlant.* i. 208, t. 85. fig. 1; *Kunth, Enum.* iv. 324.—S. bipartita, *Salzm. MSS.* Bulbus ovoideus 6–8 lin. crassus. Folia 6–8 synanthia

carnoso-herbacea glabra ascendentia lingulato-lorata, basin scapi amplectentia, 2–3 poll. longa, 4–6 lin. lata, apice cito deorsum sensim angustata. Scapus 2–4-pollicaris. Racemus oblongus subdense 6–15-florus expansus 12–18 lin. longus, 6–9 lin. latus. Bracteæ geminatæ lineares 6–9 lin. longæ. Pedicelli erecto-patentes, infimi 2–3 lin. longi. Perianthium campanulatum 2½–3 lin. longum segmentis ligulatis subobtusis ¾–1 lin. latis. Ovula in loculo 3–4. Filamenta 1½–2 lin. longa. Capsula globoso-turbinata 2–2½ lin. longa et lata. *Algeria et Mauritania.*

Species dubiæ hujus subgeneris.

35. S. LUSITANICA, *Linn. Syst. Veg.* edit. 12, ii. 243, non *Sims. Bot. Mag.* t. 1999. Folia carnoso-herbacea lorata 5–6 poll. longa, 6–7 lin. lata glabra flaccida. Scapus 4–5-pollicaris. Racemus 20–30-florus, 2–3 poll. longus, 15–18 lin. latus. Bracteæ solitariæ lineares membranaceæ albidæ 1½–2 lin. longæ. Pedicelli ascendentes, inferiores 9–12 lin. longi. Perianthium albidum 3 lin. longum segmentis lanceolatis ultra 1 lin. latis. Stamina lanceolata 1½ lin. longa. *Lusitania*, teste Linnæus. Exemplum originale ex horto Upsaliensi in herb. Linn. examinavi, sed ovula non vidi. Ad *S. italicam* habitu magis accedit sed differt bracteis solitariis brevioribus, foliis latioribus, etc.

36. S. PLUMBEA, *Lindl. Bot. Reg.* t. 1355; *Kunth, Enum.* iv. 328 (excl. planta Dregei). Bulbi gregarii ovoidei 2–3 poll. crassi. Folia carnoso-herbacea synanthia lorato-lanceolata subpedalia immaculata acuta glabra 15 lin. lata. Racemus 15–20-florus expansus 3–3½ poll. longus, 18–21 lin. latus. Bracteæ lineares 2–3 lin. longæ. Pedicelli infimi subpatentes 6–8 lin. longi. Perianthium sordide cæruleum 3–3½ lin. longum campanulatum. Stamina segmentis paulo breviora. Capsula subglobosa 4-polysperma. *Cap. B. Spei*, ab planta anno 1813 in hort. Kew. culta depicta (non vidi). Ad *S. natalensem* verisimiliter arcte accedit. An eadem?

37. S. FLEXUOSA, *Baker.*—Hyacinthus flexuosus, *Thunb. Prodr.* 64; *Kunth, Enum.* iv. 305. Folia synanthia subteretia glabra carnoso-herbacea, ad pedem longitudine attingentia, lineam lata, flexuosa, basin scapi longe involventia. Scapus flexuosus gracilis semipedalis. Racemus 10–12-florus expansus 15–18 lin. longus, 1 poll. latus. Bracteæ lanceolatæ membranaceæ persistentes pedicellis æquilongæ. Pedicelli graciles flexuosi, inferiores 4–5 lin. longi. Perianthium campanulatum 2½ lin. longum segmentis lanceolatis ¾ lin. latis. Stamina segmentis paulo breviora. *Cap. B. Spei*, Thunberg!

Subgenus II. Ledebouria, *Baker in Saund. Ref. Bot.* iii. App. 5.

Perianthium roseo-purpureum vel viridulum, segmentis ligulatis basi in cupulam diutine conniventibus dimidio superiore flore expanso falcatis. *Filamenta* supra basin segmentorum subuniseriata. *Ovarium* globosum stipitatum basi sæpissime ampliatum discoideum, ovulis in loculo semper geminatis collateralibus. *Bracteæ* parvæ solitariæ deltoideæ.—Ledebouria, *Roth.* —Barnardia, *Wight* non *Lindl.*—Eratobotrys, *Fenzl.*—Drimia. *Kunth* non *Jacq.*—Xeodolon et Sugillaria, *Salisb.*

38. S. Sandersoni, *Baker in Saund. Ref. Bot.* iii. App. 5. Folia synanthia carnoso-herbacea ascendentia ovato-oblonga subacuta basi cito angustata 2–2½ poll. longa, 9–15 lin. lata venis permultis immersis. Scapi 2–2½ pollicares. Racemi rotundati subdense 12–20-flori 9–10 lin. lati floribus pluribus abortivis. Pedicelli 3–4 lin. longi inferiores cernui. Perianthium rotundato-campanulatum 1½ lin. longum saturate roseo-purpureum segmentis ligulatis ⅓ lin. latis dorso distincte viridi vittatis flore expanso dimidio superiore falcatis. Filamenta filiformia roseo-purpurea 1 lin. longa. Ovarium globosum stipitatum, basi discoideo-productum. Stylus filiformis ½ lin. longus saturate coloratus. *Cap. B. Spei in ditione Transvaal,* Sanderson!

39. S. revoluta, *Baker in Saund. Ref. Bot.* iii. App. 6.—Hyacinthus revolutus, *Linn. Suppl.* 204: *Thunb. Prodr.* 64; *Fl. Cap.* 326.— —Phalangium revolutum, *Pers. Syn.* i. 367.—Xeodolon revolutum, *Salisb. Gen.* 18.—Drimia? revoluta, *Kunth, Enum.* iv. 341.—Drimia ovalifolia, *Schrad. Diss. de Blumenb.* 30; *Kunth, Enum.* iv. 339.— D. Gawleri, *Schrad. et Kunth,* loc. cit.—D. lanceæfolia, β, *Gawl. Bot. Mag.* t. 1380.—D. lanceæfolia, *Lodd. Bot. Cab.* t. 278. Bulbus globosus abunde proliferus. Folia 5–9 carnoso-herbacea patula synanthia oblanceolato-spathulata acuta basi in petiolum brevem canaliculatum sensim angustata 2½–3 poll. longa, 6–8 lin. lata viridia facie rugosula. Scapus centralis gracillimus flexuosus 3–6-pollicaris apice primum nutans basi coloratus. Racemi oblongo-lanceolati laxe 12–30-flori expansi 2–3 poll. longi, 12–15 lin. lati. Pedicelli patentes inferiores 6–8 lin. longi, floribus cernuis. Perianthium rotundato-campanulatum 1½ lin. longum saturate roseo-purpureum segmentis ligulatis ½ lin. latis dorso viridi-vittatis flore expanso dimidio superiore falcatis. Filamenta filiformia roseo-purpurea 1 lin. longa. Stylus filiformis saturate coloratus. Capsula globosa stipitata basi discoideo-producta. *Cap. B. Spei,* Burchell, 7892! Olim in hortis Europæis sæpe culta sed nunc verisimiliter perdita.

40. S. minima, *Baker in Saund. Ref. Bot. App.* iii. 6. Bulbus elongato-ovoideus 3–4 lin. crassus, tunicis extimis apice membranaceis

productis. Folia synanthia carnoso-herbacea ascendentia viridia glabra linearia acuta 12–18 lin. longa, 1–1½ lin. lata. Scapi 1–2 gracillimi flexuosi 1–2 poll. longi. Racemus oblongus subdense 12–30-florus expansus 1 poll. longus, 5–6 lin. latus. Pedicelli 1½–2 lin. longi subpatentes, inferiores cernui. Perianthium rotundato-campanulatum 1 lin. longum saturate roseo-purpureum segmentis 1¼ lin. latis dorso late viridi-vittatis flore expanso dimidio superiore falcatis. Filamenta purpurascentia segmentis paulo breviora. Ovarium stipitatum, basi discoideo-producta. *Cap. B. Spei,* Drège, 3510! *Ad montes Macalisberg,* Burke!

41. S. EXIGUA, *Baker.* Folia carnoso-herbacea 3–4 synanthia ascendentia lanceolata 1½–2 poll. longa, 3 lin. lata purpureo striata et maculata. Scapus strictus 2–3-pollicaris. Racemus subdense 12–20-florus expansus oblongus circiter 1 poll. longus, 5–6 lin. latus. Pedicelli 1½–2 lin. longi, infimi cernui. Perianthium rotundato-campanulatum 1½ lin. longum segmentis saturate roseo-purpureis fundo extrorsum viridibus. Filamenta filiformia segmentis distincte breviora. Ovarium breviter stipitatum basi productum discoideum. *Natalia* (*Assagai Kraal, Camperdown*), Sanderson, 670!

42. S. BARBERI, *Baker.* Folia synanthia carnoso-herbacea linearia glabra 2–2½ poll. longa, 1½ lin. lata. Scapus 2–2½-pollicaris. Racemus laxe 6–15-florus expansus oblongus 12–15 lin. longus, 7–8 lin. latus. Pedicelli 1½–2 lin. longi subpatentes, inferiores cernui. Perianthium oblongo-campanulatum 2 lin. longum saturate roseo-purpureum fundo extrorsum viridescens. Filamenta filiformia purpurea segmentis paulo breviora. Ovarium distincte stipitatum basi productum discoideum. *Cap. B. Spei* (*ad ripas fluminis Tsomo*), Mrs. Barber, 805!

43. S. COOPERI, *Hook. fil. Bot. Mag.* t. 5580; *Baker in Saund. Ref. Bot.* iii. App. 7. Bulbus subglobosus purpureus 1 poll. crassus. Folia 4–5 synanthia suberecta carnoso-herbacea lineari-lanceolata ad apicem acutum sensim angustata 8–10 poll. longa, 6–9 lin. lata viridia dorso purpureo striata basi maculata. Scapus firmus flexuosus 5–6-pollicaris. Racemus subdense 30–50-florus expansus cylindricus 2–3 poll. longus, 1 poll. latus. Pedicelli subpatentes 4–6 lin. longi inferiores cernui. Perianthium globoso-campanulatum 1½ lin. longum segmentis ½ lin. latis dorso viridibus flore expanso dimidio superiore falcatis. Filamenta filiformia 1 lin. longa saturate purpurea. Ovarium stipitatum basi productum discoideum. Stylus purpureus 1 lin. longus demum leviter exsertus. *Cap. B. Spei,* Cooper! Cult. hort. Kew. 1863.

44. S. ZAMBESIACA, *Baker in Saund. Ref. Bot.* iii. App. 8. Bulbus ovoideus 8–9 lin. crassus tunicis exterioribus membranaceis productis.

Folia 2–3 synanthia carnoso-herbacea tenera acuta ovato-lanceolata 2–2½ poll. longa, 9–10 lin. lata margine valde undulata basi in petiolum pollicem longum caulem amplectentem attenuata. Scapi erecti gracillimi 2–3-pollicares. Racemi sublaxe 30–40-flori expansi cylindrici 2–3 poll. longi, 5–6 lin. lati. Pedicelli patentes 1½–2 lin. longi floribus cernuis. Perianthium rotundato-campanulatum 1 lin. longum utrinque viridulum segmentis ⅓ lin. latis margine pallidioribus flore expanso dimidio superiore reflexis. Filamenta albida segmentis paulo breviora. Ovarium stipitatum basi nullo modo discoideum. *Africa tropicalis austro-orientalis ad ripas fluminis Zambesi ad Tette,* Dr. Kirk !

45. S. CAMEROONIANA, *Baker in Saund. Ref. Bot.* iii. App. 9. Bulbus ovoideus 8–9 lin. crassus. Folia carnoso-herbacea synanthia suberecta lorata 5–6 poll. longa, 6–8 lin. lata apice subobtusa brevissime cuspidata basi in petiolum caulem amplectantem sensim angustata. Scapi graciles flexuosi 4–6-pollicares. Racemi laxe 20–30-flori expansi cylindrico-lanceolati 2–3 poll. longi, 6–9 lin. lati. Pedicelli subpatentes 3–4 lin. longi inferiores apice cernui. Bracteæ minutæ interdum geminatæ. Perianthium rotundato-campanulatum 1½–2 lin. longum segmentis dorso viridibus facie leviter purpureo tinctis. Filamenta roseo-purpurea filiformia ultra 1 lin. longa. Ovarium stipitatum basi discoideum productum. *Africa tropicalis occidentalis ad ripas fluminis Camaroon,* Mann, 728 ! 2230 !

46. S. PRASINA, *Baker in Saund. Ref. Bot.* iii. App. 10. Bulbus elongato-ovoideus 9–12 lin. crassus. Folia 5–6 carnoso-herbacea patentia oblongo-lanceolata 4–5 poll. longa medio 12–15 lin. lata, acuta tertio inferiore angustata sæpe purpureo maculata. Scapi flexuosi deflexi 3–4 poll. longi. Racemus subdense 30–50-florus, expansus lanceolatus vel subcylindricus 1½–2 poll. longus, 6–10 lin. latus. Pedicelli centrales horizontaliter patentes 1½–2½ lin. longi, inferiores deflexi. Perianthium rotundato-campanulatum viridulum segmentis ½ lin. latis dimidio superiore falcatis. Filamenta 1 lin. longa saturate purpurea. Ovarium stipitatum basi productum discoideum. *Cap. B. Spei* (*Grahamstown,* cult. hort. Kew. 1862–3). *Kaffraria,* Dr. Gill !

47. S. LUDWIGII, *Baker in Saund. Ref. Bot.* iii. App. 9.—Drimia Ludwigii, *Miquel, Bull. Scien. Phys. Néerl.* 1839, 39.—Idothea? Ludwigii, *Kunth, Enum.* iv. 681.—Drimia ensifolia, *Ecklon, Linnæa,* xx. 235 (nomen solum). Bulbus ovoideus 8–9 lin. crassus tunicis exterioribus apice productis membranaceis. Folia 5–6 ascendentia carnoso-herbacea lanceolata 2–3 poll. longa, 5–6 lin. lata, basi vix angustata, ad apicem acutum sensim angustata. Scapus 1–3-pollicaris. Racemi dense 20–40-flori expansi cylindrico-lanceolati 1½–2 poll. longi, 4–5

lin. lati. Pedicelli 1½–2 lin. longi, inferiores cernui. Perianthium viride rotundato-campanulatum 1 lin. longum. Filamenta purpurascentia filiformia segmentis paulo breviora. Ovarium stipitatum basi discoideum. *Cap. B. Spei,* Zeyher, 4262! Drège, 8618*a*!

48. S. MÆSTA, *Baker in Saund. Ref. Bot.* iii. App. 10. Bulbus ovoideus 15–18 lin. crassus. Folia 5–6 synanthia carnoso-herbacea lanceolata suberecta 5–6 poll. longa, 6–9 lin. lata purpureo maculata basi leviter angustata dimidio superiore ad apicem acuminatum sensim attenuata. Scapi 2–3 flexuosi 3–4-pollicares. Racemus subdense 30–50-florus expansus cylindricus 1½–2 poll. longus, 6–7 lin. latus. Pedicelli ascendentes 3–4 lin. longi. Perianthium viride oblongo-cylindricum 1½ lin. longum. Filamenta viridula segmentis distincte breviora ¾ lin. longa. Ovarium stipitatum basi productum discoideum. *Africa tropicalis austro-orientalis ad deltam fluminis Zambesi prope Luabo,* Dr. Kirk!

49. S. UNDULATA, *Baker in Saund. Ref. Bot.* iii. App. 11.—Drimia undulata, *Jacq. Icones,* t. 376; *Kunth, Enum.* iv. 340. Bulbus globosus 1½–2 poll. crassus dimidio inferiore epigæo squamoso. Folia post scapum producta 5–6 firmula lanceolata acuta glauca glabra ascendentia undulata 4 5 poll. longa, 3–4 lin. lata. Scapus firmus teres 1½–2-pollicaris. Racemus subdense 20–30-florus expansus oblongus 1½–2 poll. longus, 12–15 lin. latus. Pedicelli horizontales 3–5 lin. longi. Perianthium 3–4 lin. longum oblongo-campanulatum viridulum leviter purpureo tinctum. Filamenta albida segmentis paulo breviora. Ovarium stipitatum. *Cap. B. Spei.*

50. S. CURRORI, *Baker.* Folia synanthia carnoso-herbacea rotundata cuspidata 8–9 lin. longa, 7–8 lin. lata basi rotundata vel leviter cordata petiolo distincto 5–6 lin. longo scapum amplectente. Scapus erectus rectus subpollicaris. Racemus subdense 10–12-florus 9–10 lin. latus. Pedicelli stricti erecto-patentes 5–6 lin. longi. Perianthium tubuloso-campanulatum 2½ lin. longum, segmentis ligulatis ½ lin. latis purpureis margine pallidioribus. Filamenta pallida filiformia segmentis duplo breviora. Ovarium sessile turbinatum basi nullo modo discoideo-productum. Stylus filiformis purpureus ovario æquilongus. *Guinea æquinoctialis,* Curror, 26!

51. S. RICHARDIANA, *Buching. in herb. Abyss. Quart.-Dill. et Petit,* no. 46; *Baker in Saund. Ref. Bot.* iii. App. 11.—Eratobotrys bifolia, *Hochst. in Schimp. Pl. Abyss.* no. 1622; *Rich. Fl. Abyss.* ii. 326.—Drimia bifolia, *Schwein. Beitr. Fl. Æthiop.* 294. Bulbus ovoideus immersus 8–9 lin. crassus. Folia 2 opposita carnoso-herbacea synanthia oblongo-lanceolata glabra subacuta, interdum margine bulbillifera, 2–2½ poll. longa, 8–12 lin. lata basi in petiolum pollicem longum caulem amplectentem angustata. Scapi 1–2 erecti 4–6-

pollicares. Racemi sublaxe 10–30-flori expansi oblongi vel cylindrici 1–3 poll. longi, 9–12 lin. lati. Pedicelli 3–4 lin. longi primum cernui. Perianthium oblongo-campanulatum 2–2½ lin. longum viridulum leviter purpureo tinctum segmentis dimidio superiore falcatis. Filamenta purpurea segmentis paulo breviora. Ovarium globosum subsessile basi haud discoideum. *Abyssinia,* Schimper, 572! 1622! Quartin-Dillon et Petit, 46!

52. S. MACULATA, *Baker.*—Ledebouria maculata, *Dalzell in Hook. Kew Journ.* ii. 143; *Bombay Flora,* ii. 51; *Walp. Ann.* iii. 632. Bulbus ovoideus immersus 8–9 lin. crassus ad apicem tunicatus. Folia 3–4 synanthia carnoso-herbacea oblonga obtusa 2–3 poll. longa, 9–12 lin. lata facie maculata margine nunquam bulbillifera basi in petiolum caulem amplectentem sensim angustata. Scapi 1–2 graciles 4–8-pollicares. Racemi subdense 20–50-flori expansi 2–4 poll. longi, 10–12 lin. lati. Pedicelli subpatentes 3–4 lin. longi. Perianthium 2 lin. longum viridulo-purpureum. Filamenta saturate purpurea segmentis paulo breviora. Ovarium distincte stipitatum, basi haud discoideo-productum. *India orientalis, in utroque Concano ubique,* Dalzell, Stocks! Law! etc.

53. S. INDICA, *Baker in Saund. Ref. Bot.* iii. App. 12.—Ledebouria hyacinthina, *Roth, Nov. Spec.* 195; *Kunth, Enum.* iv. 336; *Decne, in Jacquem. Voy.* t. 171; *Wight, Icones,* t. 2040; *Hook. Bot. Mag.* t. 3226.—Barnardia indica, *Wight, Icones,* t. 2041. Melanthium hyacinthinum, *Heyne.*—Erythronium indicum, *Rottler.* Bulbus ovoideus apice squamosus 1–2 poll. crassus. Folia 5–6 synanthia carnoso-herbacea oblonga vel lanceolota acuta margine sæpe bulbillifera basi sensim angustata basin scapi amplectentia 3–6 poll. longa, 6–15 lin. lata. Scapi 1–3 flexuosi 2–6-pollicares. Racemi dense 30–60-flori, expansi oblongo-cylindrici 2–4 poll. longi, 9–12 lin. lati. Pedicelli subpatentes 3–4 lin. longi. Perianthium 1½–2 lin. longum subrotundato-campanulatum, viridulo-purpureum, segmentis dimidio superiore falcatis. Filamenta purpurea segmentis paulo breviora. Ovarium globosum distincte stipitatum basi haud discoideum. *India orientalis peninsularis,* Wallich, 5170! Wight, 2928! Ritchie, 733! etc. *Zeylania,* Thwaites, C.P. 3829! *Abyssinia, Callabat,* Schweinfurth, 13! (sub nomine *Drimiæ lilacinæ*).

54. S. LILACINA, *Baker in Saund. Ref. Bot.* iii. App. 13.—Eratobotrys lilacina, *Fenzl. in Kotschy, Pl. Nub.* no. 391; *Kunth, Enum.* iv. 679. —Drimia lilacina, *Schwein. Beitr. Ethiop.* 294. Bulbus ovoideus apice squamosus 1½–2 poll. crassus. Folia 6–8 synanthia carnoso-herbacea suberecta oblongo-lanceolata acuta undulata 3–4 poll. longa, 12–15 lin. lata basi in petiolum latum 1–2 poll. longum caulem amplectentem cuneatim angustata. Scapi 1–3 flexuosi graciles 4–6-pollicares. Racemi sublaxe 30–60-flori expansi cylindrici

3–5 poll. longi, 12–15 lin. lati. Pedicelli inferiores subpatentes 3–5 lin. longi floribus cernuis. Perianthium 3–3½ lin. longum tubuloso-campanulatum lilacino-purpureum segmentis ligulatis lateribus et apice, more *Drimiæ*, inflexis. Filamenta saturate colorata 2–2½ lin. longa. Ovarium turbinatum sessile basi nullo modo discoideo-productum. *Nubia*, Kotschy, 391 !

55. S. PAUCIFOLIA, *Baker in Saund. Ref. Bot.* t. 181. Bulbi gregarii ovoidei 12–15 lin. crassi apice emersi squamosi. Folia 2 opposita vel raro 3 synanthia patentia carnoso-herbacea oblongo-lanceolata acuta undulata 2½–3 poll. longa, 9–10 lin. lata, facie pallide viridia maculis saturatioribus notata, basi leviter angustata caulem amplectentia. Scapus firmus immaculatus teres 3–4-pollicaris. Racemus laxe 20–30-florus, expansus oblongus 3–4 poll. longus, 15–18 lin. latus. Pedicelli 5–6 lin. longi, inferiores cernui. Perianthium viridulum rotundato-campanulatum 2½–3 lin. longum, segmentis dimidio superiore falcatis. Filamenta saturate purpurea segmentis paulo breviora. Ovarium stipitatum basi discoideo-productum. *Cap. B. Spei*, Cooper; (*v. v. in hort. Saundersii*).

56. S. SOCIALIS, *Baker in Saund. Ref. Bot.* t. 180. Bulbi gregarii ovoidei 15–18 lin. lati apice emersi squamosi. Folia synanthia 3–4 carnoso-herbacea patentia oblongo-lanceolata acuta 2–2½ poll. longa, infra medium 9–12 lin. lata, basi leviter angustata, facie pallide glauco-viridia maculis saturatioribus notata. Scapus firmus teres immaculatus 2–3-pollicaris. Racemus dense 20–30-florus expansus oblongus 1½–2 poll. longus, 1 poll. latus. Pedicelli 1½–2 lin. longi, inferiores cernui. Perianthium viridulum rotundato-campanulatum 2–2½ lin. longum segmentis dimidio superiore falcatis. Filamenta 1½ lin. longa saturate purpurea. Ovarium stipitatum, basi discoideo-productum. *Cap. B. Spei*, Cooper ! (*v. v. in horto Saundersii*).

57. S. LANCEÆFOLIA, *Baker in Saund. Ref. Bot.* t. 182.—Lachenalia lanceæfolia, *Jacq. Ic.* t. 402; *Red. Lil.* t. 59; *Bot. Mag.* t. 643.—Drimia lanceæfolia, *Gawl. Bot. Mag.* sub t. 1380; *Kunth, Enum.* iv. 339.—Sugillaria lanceæfolia, *Salisb. Gen.* 18.—Drimia acuminata, *Lodd. Bot. Cab.* t. 1041. Bulbus ovoideus 1½–2 poll. crassus apice emersus squamosus. Folia 6–8 synanthia carnoso-herbacea subpatentia oblonga acuta 4–6 poll. longa, supra medium 1½–2 poll. lata, basi paullulum angustata, facie pallide viridia maculis saturatioribus notata. Scapi 1–3 firmi teretes 2–4 poll. longi sæpe decurvati. Racemi dense 30–50-flori expansi oblongi 2–3 poll. longi, 15–18 lin. lati. Pedicelli 5–6 lin. longi inferiores deflexi. Perianthium subgloboso-campanulatum 2½–3 lin. longum segmentis ligulato-lanceolatis intus purpureis dorso viridulis. Filamenta 2 lin. longa saturate purpurea. Ovarium stipitatum basi discoideo-productum. *Cap. B. Spei*, Cooper ! Drege,

8617! Burchell, 2305! *Kaffraria*, Dr. Gill! *Natalia*, Plant, 102! Krauss, 464!—Scilla maculata, *Schrank, Pl. Rar. Hort. Monac.* t. 100, est forma scapis semipedalibus foliis duplo longioribus.

Var. *β*, OVATIFOLIA, *Baker*.—S. ovatifolia, *Baker in Saund. Ref. Bot.* t. 183. Folia breviora, late ovata, 2–3 poll. longa supra medium 18–24 lin. lata. *Cap. B. Spei*, Cooper! (*v. v. in hort. Saund.*).

58. S. CONCOLOR, *Baker in Saund. Ref. Bot.* iii. App. 13.—Drimia Cooperi, *Baker in Saund. Ref. Bot.* t. 18.—D. Dregeana, *Kunth, Enum.* iv. 340? Bulbus ovoideus 1½–2 poll. crassus sursum cinereus squamosus. Folia 5–6 synanthia carnoso-herbacea falcata ligulato-lanceolata 5–8 poll. longa, medio 15–18 lin. lata, obtusa vel subacuta, basi paullulum angustata, utrinque saturate viridia immaculata. Scapi 1–3 flexuosi virides 3–4-pollicares. Racemi dense 30–50-flori expansi oblongo-cylindrici 3–4 poll. longi, 9–12 lin. lati. Pedicelli 2–4 lin. longi, inferiores cernui. Perianthium viridulum rotundato-campanulatum 2½ lin. longum. Filamenta viridula segmentis paulo breviora. Ovarium stipitatum basi discoideo-productum. *Cap. B. Spei*, Drege, 8616 *a*! Burchell, 4568! Cooper! (*v. v. in hort. Kew. et Saund.*).

59. S. LINEARIFOLIA, *Baker in Saund. Ref. Bot.* t. 194.—Drimia angustifolia, *Kunth, Enum.* iv. 340? Bulbus ovoideus 1½–2 poll. crassus apice immersus. Folia 4–6 carnoso-herbacea erectiuscula linearia 9–12 poll. longa, 4–8 lin. lata acuta basi paullulum angustata pallide viridia dorso deorsum paullulum purpureo-maculata. Scapus flexuosus 3–4-pollicaris. Racemus subdense 30–40-florus, expansus oblongus 2–3 poll. longus, 15–18 lin. latus. Pedicelli 3–5 lin. longi, inferiores cernui. Perianthium 2½–3 lin. longum oblongo-campanulatum, intus saturate purpureum, extus viridulum, segmentis flore expanso dimidio superiore falcatis. Filamenta 1½–2 lin. longa saturate colorata. Ovarium stipitatum, basi discoideo-productum. *Cap. B. Spei*, Cooper! (*v. v. in hort. Saund.*), Burchell, 2545! Burke! *In ditione Transvaal*, Baines!—D. angustifolia, *Kunth* (Drege, 8618 *b*), ex descriptione, est verisimiliter forma hujus speciei foliis angustioribus. Dicuntur 1¼ lin. latis.

60. S. CONCINNA, *Baker in Saund. Ref. Bot.* t. 235. Bulbus ovoideus immersus. Folia 3–4 carnoso-herbacea synanthia erectiuscula linearia 8–9 poll. longa, 6–9 lin. lata apice basi paullulum angustata, saturate glauco-viridia dorso prorsus maculis purpureis notata. Scapus firmus erectus teres 2–6-pollicaris. Racemus dense 20–30-florus expansus oblongus 1½–2 poll. longus, 12–15 lin. latus. Pedicelli omnes erecto-patentes infimi 4–5 lin. longi. Perianthium oblongo-campanulatum 2½ lin. longum intus saturate roseo-purpureum. Filamenta 1½ lin. longa saturate colorata. Ovarium stipitatum basi discoideo-productum. *Cap. B. Spei*, Cooper! (*v. v. in hort. Saund.*).

61. S. SUBGLAUCA, *Baker in Saund. Ref. Bot.* t. 186. Bulbus immersus subglobosus 1½–2 poll. crassus. Folia 5–6 synanthia carnoso-herbacea lorato-lanceolata 9–10 poll. longa medio 1 poll. lata acuta basi distincte angustata, facie pallide glauco-viridia, dorso leviter purpureo-maculata. Scapus maculatus 3–4-pollicaris. Racemi sublaxe 30–40-flori expansi 3–4 poll. longi, 18–20 lin. lati. Pedicelli 6–7 lin. longi inferiores cernui. Perianthium oblongo-campanulatum 3 lin. longum extus viridulum intus purpureum. Filamenta 2 lin. longa saturate purpurea. Ovarium stipitatum basi discoideo-productum. *Cap. B. Spei,* Cooper! (*v. v. in hort. Saund.*).

62. S. LORATA, *Baker in Saund. Ref. Bot.* iii. App. 14.—Drimia apertiflora, *Baker in Saund. Ref. Bot.* t. 19. Bulbus ovoideus immersus 1½–2 poll. crassus. Folia 5–6 synanthia carnoso-herbacea erectiuscula lorato-lanceolata 8–9 poll. longa, medio 10–12 lin. lata, acuta, basi paullulum angustata, saturate viridia dorso deorsum purpureo-maculata. Scapus teres erectus 8–9-pollicaris dimidio inferiore maculatus. Racemus subdense 30–60-florus expansus oblongo-cylindricus 3–4 poll. longus, 18–21 lin. latus. Pedicelli 4–5 lin. longi, inferiores cernui. Perianthium livide purpureum segmentis margine et dorso viridulo tinctis, 3–4 lin. longum oblongo-campanulatum. Filamenta purpurea segmentis breviora. Ovarium stipitatum, basi discoideo-productum. *Cap. B. Spei,* Cooper! (*v. v. in hort. Saund.*).

63. S. ZEBRINA, *Baker in Saund. Ref. Bot.* t. 185. Bulbus subimmersus 1½–2 poll. crassus. Folia 5–6 synanthia carnoso-herbacea ligulato-lanceolata erectiuscula 8–12 poll. longa, 12–21 lin. lata acuta basi leviter angustata, facie pallide viridia glaucescentia dorso prorsus purpureo striata deorsum purpureo maculata. Scapus 4–6-pollicaris deorsum maculatus. Racemi dense 30–40-flori expansi oblongo-cylindrici 3–4 poll. longi, 15–16 lin. lati. Pedicelli 3–4 lin. longi, inferiores cernui. Perianthium rotundato-campanulatum 3 lin. longum purpureo-viridulum. Filamenta saturate purpurea, segmentis distincte breviora. Ovarium stipitatum basi discoideo-productum. *Cap. B. Spei,* Cooper! (*v. v. in hort. Saund.*).

64. S. SPATHULATA, *Baker in Saund. Ref. Bot.* t. 187. Bulbus ovoideus 2–2½ poll. crassus purpureus sursum emersus squamosus. Folia 5–6 synanthia carnoso-herbacea lorato-spathulata 6–8 poll. longa, 18–21 lin. lata, pallide glauco-viridia, maculis saturatioribus et purpureis notata. Scapus flexuosus 3–4-pollicaris. Racemus dense 30–40-florus expansus 3–4 poll. longus, 18–21 lin. latus. Pedicelli 6–7 lin. longi, inferiores cernui. Perianthium oblongo-campanulatum 3½ lin. longum intus purpureum, extus viridulum. Filamenta saturate purpurea segmentis paulo breviora. Ovarium stipitatum, basi discoideo-productum. *Cap. B. Spei,* Cooper! (*v. v. in hort. Saund.*).

65. S. Kirkii, *Baker.* Folia synanthia, carnoso-herbacea, crassiora et firmiora quam in speciebus reliquis, oblongo-lanceolata acuta, lamina 6–8 poll. longa, 1½–2 poll. lata, basi in petiolum latum canaliculatum 2–4 poll. longum cuneatim angustata. Scapus validus subpedalis. Racemus laxe 30–40-florus expansus 5–6 poll. longus, 18–20 lin. latus. Pedicelli 2–5 lin. longi, centrales subpatentes, floribus inferioribus cernuis. Perianthium 4½ lin. longum, tubuloso-campanulatum, extus viridulum, intus purpureum, segmentis angustis, more *Drimiæ*, lateribus et apice involutis. Filamenta 3½ lin. longa saturate purpurea. Ovarium stipitatum. *Zanzibar,* Dr. Kirk, 66.

66. S. lanceolata, *Baker in Saund. Ref. Bot.* iii. App. 14.—Drimia lanceolata, *Schrad. Diss.* 28; *Kunth, Enum.* iv. 339.—Lachenalia reflexa, *Andrews, Bot. Rep.* t. 299; *Tratt. Tab.* t. 169. Bulbus subglobosus immersus 15–18 lin. crassus. Folia 5–6 synanthia carnoso-herbacea lanceolata acuta 3–4 poll. longa, 8–10 lin. lata viridia immaculata. Scapus flexuosus 4–5-pollicaris. Racemus laxissime 8–12-florus expansus 1½–2 poll. longus, 1½ poll. latus. Pedicelli rubro-punctati subpatentes, inferiores 5–6 lin. longi. Perianthium tubuloso-campanulatum 4–4½ lin. longum purpureo-viridulum. Filamenta saturate colorata segmentis paulo breviora. Ovarium stipitatum. *Cap. B. Spei* (non vidi).

67. S. floribunda, *Baker in Saund. Ref. Bot.* t. 188. Bulbus subglobosus subimmersus 2–2½ poll. crassus. Folia 5–6 synanthia carnoso-herbacea erectiuscula lorata ad pedem longa, medio 21–24 lin. lata, acuta, basi vix angustata, pallide viridia maculis saturatioribus notata. Scapus validus erectus 6–9-pollicaris. Racemus subdense 60–100-florus vel ultra axi incrassato sulcato, expansus, 6–8 poll. longus, 2 poll. latus. Pedicelli 6–8 lin. longi, centrales patentes, inferiores cernui. Perianthium oblongo-campanulatum 4¼–5 lin. longum extus viridulum intus roseo-purpureum. Filamenta 3 lin. longa saturate colorata. Ovarium stipitatum basi discoideo-applanatum. *Cap. B. Spei,* Cooper! (*v. v. in hort. Saund.*).

68. S. pendula, *Baker in Saund. Ref. Bot.* iii. App. 14.—Drimia pendula, *Burchell, MSS.* Folia synanthia carnoso-herbacea lorata 12–15 poll. longa, medio 15–16 lin. lata, acuta, basi leviter angustata, planiuscula pallide viridia obsolete maculata. Scapus gracillimus flexuosus 8–9-pollicaris. Racemi subdense 30–60-flori expansi 3–6 poll. longi, 2½–3 poll. lati. Pedicelli gracillimi 9–15 lin. longi, multi cernui. Perianthium 4–4½ lin. longum oblongo-campanulatum extus viridulum, intus purpureum. Filamenta saturate purpurea segmentis paulo breviora. Ovarium stipitatum, basi discoideo-ampliatum. *Cap. B. Spei,* Burchell! (*v. s. ex hort. Burchell.,* 1818 *et* 1821).

69. S. princeps, *Baker in Saund. Ref. Bot.* t. 189. Bulbus globosus

immersus 2½–3 poll. crassus. Folia 5–6 synanthia carnoso-herbacea lorata, 18–24 poll. longa, 2–2½ poll. lata, acuta, basi angustata, pallide viridia maculis saturatioribus notata. Scapi 2–3 validi 7–9-pollicares. Racemus dense 150–200-florus, axi incrassato sulcato expansus pedem longus, 3–3½ poll. latus. Pedicelli 12–15 lin. longi, centrales patentes, inferiores cernui. Perianthium oblongo-campanulatum 4½–5 lin. longum intus rubro-purpureum, extus viridulum, segmentis 1 lin. latis dimidio superiore reflexis. Filamenta 3–3½ lin. longa saturate purpurea. Ovarium stipitatum basi discoideo-applanatum. *Cap. B. Spei,* Cooper! (*v. v. in hort. Saund. et v. s. ex hort. Kew.*).

Species dubia hujus subgeneris.

70. S. VIRIDIFLORA, *Baker.*—Drimia viridiflora, *Ecklon? Kunze, Linnæa,* xx. 10. Folia scapo breviora lineari-subulata canaliculata. Racemus multiflorus pedicellis patentibus flore brevioribus. Perianthium extus viridulum, intus albidum. *Cap. B. Spei,* Gueinzius (non vidi).

Subgenus III. ENDYMION, *Baker in Saund. Ref. Bot.* iii. App. 5.

Perianthium normaliter cæruleum sed sæpe mutatione roseo-purpureum vel albidum, segmentis flore expanso dimidio inferiore diutine conniventibus, dimidio superiore falcatis. *Filamenta* supra basin segmentorum distincte biseriata. *Ovarium* sessile loculis pluriovulatis. *Bracteæ* lineares geminatæ.—Scilla, sectio β, *Kunth* (excl. *S. Lilio-hyacinthus*).—Endymion, *Dumort.*—Agraphis et Limonanthe, *Link.*—Usteria, *Medic.*—Hylomenes, *Salisb.*

71. S. HISPANICA, *Mill. Dict.* no. 8.—S. campanulata, *Ait. Hort. Kew.* i. 444; *Bot. Mag.* t. 127; *Red. Lil.* t. 435.—S. hyacinthoides, *Jacq. Ic.* t. 65, non *L.*—Agraphis campanulata, *Reich. Ic. Crit.* t. 834; *Ic. Flor. Germ.* t. 1010. Bulbus ovoideus 6–12 lin. crassus. Folia 5–6 synanthia carnoso-herbacea glabra ascendentia lineari-lorata 6–9 vel in exemplis cultis 12 lin. latis subobtusis dorso convexis. Scapus 6–9-pollicaris. Racemus æquilateralis sublaxe 6–12-florus. Bracteæ lineares geminatæ 6–9 lin. longæ. Pedicelli inferiores 6–12 lin. longi, floribus magis patulis quam in *nonscripta.* Perianthium subgloboso-campanulatum 6–9 lin. longum segmentis 2–2½ lin. latis. Filamenta alterna supra basin et ad apicem tertii superioris segmentorum inserta parte libera 2½–3 lin. longa. Ovula in loculo 6–8. Capsula sequentis. *Hispania et Lusitania.* Sæpe in hortis culta. S. patula, *Red. Lil.* t. 225; *Kunth, Enum.* iv. 326.—Agraphis patula, *Reich. Ic.* t. 1009.—Endymion patulus, *Godr. Fl. France,* iii. 215.—S. campanulata, *Bot. Mag.* t. 1102, est forma floribus patulis paulo minoribus magis oblongo-campanulatis ad *nonscriptam* accedens. Etiam *in* Gallia australi et Italia crescit. De formis cultis vide *Baker, Gard. Chron.* 1872, p. 1038.

72. S. NONSCRIPTA, *Hoffm. et Link, N. Schrift. Ges. Nat. Berl.* iv. 19; *Red. Lil.* t. 224.—Hyacinthus nonscriptus, *Linn. Sp. Plant.* 453. —S. nutans, *Smith, Eng. Bot.* t. 377; *Kunth, Enum.* iv. 327.—S. festalis, *Salisb. Prodr.* 242.—Agraphis nutans et cernua, *Reich. Icones,* t. 1007–8. Bulbus ovoideus 6–9 lin. crassus. Folia 5–6 synanthia carnoso-herbacea glabra ascendentia lineari-lorata dorso convexa 8–12 poll. longa, 3–6 lin. lata. Scapus 6–12-pollicaris. Racemus nutans subsecundus laxe 6–12-florus. Pedicelli 4-6 lin. longi, floriferi cernui, fructiferi ascendentes. Bracteæ lineares geminatæ 6–9 lin. longæ. Perianthium tubuloso-campanulatum 6–9 lin. longum segmentis ligulatis 1½–2 lin. latis. Filamenta alterna ad medium segmentorum inserta parte libera 1½ lin. longa, alterna ad apicem quarti inferioris parte libera paulo longiore. Ovula in loculo 6–10. Capsula subsessilis ovoidea 5–6 lin. longa seminibus globosis nigris vix 1 lin. crassis. *A Britannia ad Hispaniam, Italiam et Illyriam.* S. cernua, *Hoffm. et Link loc. cit.* (Hyacinthus cernuus, *Linn. Sp. Plant.* 453) est forma minor hispanica et lusitanica floribus rubicundis. Forma hortensis adest (var. *bracteata,* Hort.) bracteis valde elongatis 2 poll. vel ultra longis.

32. CAMASSIA, *Lindl.*

Lindl. Bot. Reg. t. 1486; *Hook. Flor. Bor. Amer.* ii. 186; *Kunth, Enum.* iv. 346.—Cyanotris, *Rafines. Endl. Gen.* no. 1129.—Sitocodium, *Salisb. Gen.* 27.—Phalangii sp., *Nuttall et Pursh.* —Scillæ, sp., *Ker et A. Gray.*

Perianthium basi 6-partitum segmentis subæqualibus lanceolatis marcescentibus cæruleis vel albis dorso 3–8-nerviis, flore expanso irregulariter falcato-patentibus. *Stamina* 6, hypogyna, filamentis filiformibus segmentis multo brevioribus leviter declinatis, antheris oblongis versatilibus. *Ovarium* sessile ovoideum triloculare ovulis in loculo pluribus; *stylus* filiformis leviter declinatus; *stigma* tricuspidatum. *Capsula* oblonga sessilis membranacea loculicide trivalvis, seminibus in loculo 3–9 obovoideis haud compressus. *Testa* membranacea nitida nigra. *Herbæ bulbosæ bulbis edulibus, foliis synanthiis linearibus, floribus multis racemosis, bracteis solitariis elongatis.*

Perianthium 10–15 lin. longum segmentis dorso 5–8-nervatis.
1. *esculenta.*
Perianthium 6–8 lin. longum segmentis dorso 3–4-nervatis.
2. *Fraseri.*

1. C. ESCULENTA, *Lindl. Bot. Reg.* t. 1486; *Hook. Flor. Bor. Am.*

ii. 186; *Kunth, Enum.* iv. 347; *Torrey, Bot. Whipple,* 91; *Flore des Serres,* t. 275.—Phalangium Quamash, *Pursh, Flora,* i. 226.—P. esculentum, *Nuttall* (ex parte). Folia 5–6, firmula, 12–18 poll. longa, 4–6 lin. lata, facie glauco-viridia valde canaliculata, falcata, multinervata. Scapus pedalis vel sesquipedalis. Racemus 6–30-florus, expansus 3–6 poll. longus, 3–4 poll. latus. Pedicelli ascendentes, infimi 6–12 lin. longi. Bracteæ lineares 1–2-pollicares. Perianthium saturate cæruleum, vel interdum albidum, 10–15 lin. longum, segmentis lanceolatis 2–3 lin. latis dorso 5–8-nervatis, basi valde angustatus. Filamenta 6–8 lin. longa. Stylus 6–9 lin. longus leviter declinatus. Ovula in loculo 16–18. Capsula 8–9 lin. longa seminibus in loculo 6–12. *America borealis occidentalis a Columbia ad Californiam,* Douglas! Geyer, 628! Jeffrey, 1007! Fremont, 418! 1846! Bridges, 280! etc. *De usibus vide Geyer in Hook. Lond. Journ.* v. 299.

2. C. **Fraseri**, *Torrey, Bot. Whipple,* 91.—Scilla Fraseri, *A. Gray, Man.* edit. v. 553.—S. esculenta, *Gawl. Bot. Mag.* t. 1594; *Kunth, Enum.* iv. 329.—Phalangium esculentum, *Nuttall* (ex parte). Folia 6–8 firmula 12–15 poll. longa, 3–6 lin. lata facie glauca canaliculata. Scapus 1–1½-pedalis. Racemus 6–30-florus, laxior quam in *C. esculenta,* expansus 6–9 poll. longus, 2–2½ poll. latus. Pedicelli ascendentes, infimi 9–15 lin. longi. Bracteæ lineares, 9–15 lin. longæ. Perianthium pallide cæruleum 6–8 lin. longum segmentis lanceolatis dorso 3–4-nervatis 2–2½ lin. latis. Filamenta 3 lin. longa. Stylus subrectus 3–4 lin. longus. Ovula in loculo 6–8. Capsula oblonga 5–6 lin. longa seminibus in loculo 2–4. *America borealis orientalis ab Ohio ad Texas.*

Var. *β,* **angusta**, *Torrey, loc. cit.*—Scilla angusta, *Engel. et A. Gray, Bost. Journ.* v. 29; *Walp. Ann.* iii. 632. Minor foliis firmioribus 1½–3 lin. latis nervis 10–12, perianthio 3–4 lin. longo, segmentis 1 lin. latis. *Texas,* Drummond, iii. 419! Lindheimer, 198! 541!

33. Ornithogalum, *Linn.*

Linn. Gen. 418 (ex parte); *Endlich. Gen.* 1132; *Kunth, Enum.* 349.—Myogalum, *Link, Handb.* i. 164; *Endlich. Gen.* 1134; *Kunth, Enum.* iv. 348.—Honorius, *Gray, Brit. Plant.* ii. 177. —Albucea, *Reich. Consp.* no. 1367c; *Nees, Gen. Flor. Germ.* iv. t. 14.—Caruelia, *Parl. Nuov. Gen.* 22; *Walp. Ann.* vi. 119. —Eustachys, Beryllis, Brizophile, Cathissa, Myanthe, Aspasia, Phæocles, Ardernia, Tæniola, Osmyne, et Urophyllon, *Salisb. Gen.* 33-35.

Perianthium basi 6-partitum, album vel flavum, rarissime fulvum vel miniatum, nunquam cæruleum vel roseo-purpureum, segmentis subæqualibus ovato-lanceolatis vel ligulatis dorso anguste viridi-vittatis 3–4-nervatis vel late viridibus vel concoloribus, flore expanso sæpissime stellato-patentibus. *Stamina* hypogyna filamentis æqualibus vel inæqualibus linearibus vel lanceolatis, interdum alternis vel raro omnibus basi quadrato-dilatatis integris vel bicuspidatis *antheris* lineari-oblongis versatilibus. *Ovarium* sessile ovoideum, triloculare, ovulis in loculo pluribus superpositis biseriatis; *stylus* filiformis, raro subnullus; *stigma* capitatum leviter trisulcatum. *Capsula* membranacea sessilis subglobosa vel oblonga, loculicide trivalvis, seminibus in loculo pluribus parvis subglobosis vel obovoideis haud compressis. *Testa* membranacea nigra vel atro-castanea. *Herbæ bulbosæ foliis synanthiis linearibus vel loratis vel subulatis carnoso-herbaceis vel interdum firmis, racemis elongatis vel subcorymbosis, pedicellis bracteatis haud articulatis, floribus parvis vel mediocribus.*

Subgenus I. HELIOCHARMOS, *Baker*. *Stamina hypogyna. Racemi subcorymbosi vel late deltoidei. Perianthii segmenta exteriora marginibus albis angustis. Stylus filiformis* 1–2 *lin. longus.*

Racemi late ovoidei pedicellis diutine ascendentibus.
Folia concoloria. Pedicelli infimi 1½–2 poll. longi.
1. *comosum.*
Folia vittata. Pedicelli brevissimi ......2. *brevipedicellatum.*
Racemi inverse deltoidei pedicellis diutine ascendentibus.
Folia lanceolata concoloria 9–12 lin. lata.
Scapus subnullus ....3. *lanceolatum.*
Scapus 3–6-pollicaris ....4. *platyphyllum.*
Folia anguste lorata 4–8 lin. lata concoloria.
Scapus 3–6-pollicaris.
Folia geminata opposita............5. *Aucheri.*
Folia 3–4 basin scapi amplectentia ..6. *Huetii.*
Folia 5–6 basin scapi vix amplectentia.
Segmenta subacuta 1½–2 lin. lata..7. *montanum.*
Segmenta obtusa 2½–3 lin. lata....8. *cuspidatum.*
Scapus nullus ....9. *sororium.*
Folia anguste linearia 1–2 lin. lata concoloria.
10. *tenuifolium.*
Folia anguste lorata 6–7 lin. lata albido-vittata.
11. *orthophyllum.*
Folia anguste linearia 1–2 lin. lata albido-vittata.
Folia ciliata ....12. *collinum.*

Folia glaberrima.
Bulbus bulbulis foliiferis circumdatus.
13. *angustifolium.*
Bulbus simplex vel bulbulis paucis in tunicis inclusis.
14. *monticolum.*
Racemi quadrangulares pedicellis fructiferis inferioribns patentibus .... 15. *umbellatum.*
Racemi quadrangulares pedicellis fructiferis inferioribus deflexis.
Scapi producti 3–6 poll. longi.
Folia facie concoloria .... 16. *paterfamilias.*
Folia facie albido-vittata.
Folia 1–1½ lin. lata racemis duplo eminentia.
17. *refractum.*
Folia 2–3 lin. lata racemis paulo eminentia.
18. *divergens.*
Scapi subnulli vel brevissimi.
Folia bina opposita ....19. *æmulum.*
Folia plura.
Folia ubique pilosa ....20. *fimbriatum.*
Folia glabra.
Bracteæ pedicellis infimis breviores.
Folia anguste linearia ....21. *exscapum.*
Folia oblanceolato-linearia ....22. *Cydni.*
Bracteæ pedicellis infimis longiores.
23. *nanum.*

Subgenus II. CARUELIA (Parl.). *Stamina hypogyna. Racemi subcorymbosi vel late deltoidei. Perianthii segmenta concoloria vel apice brunneo-maculata. Stylus subnullus vel brevissimus.*

Segmenta apice brunneo-maculata.
Perianthium albidum segmentis obtusis.
24. *Thunbergianum.*
Perianthium croceum segmentis acutis. 25. *maculatum.*
Segmenta apice concoloria.
Filamenta alterna basi quadrangularia obscure vel distincte bicuspidata.
Folia lanceolata 1–2 poll. lata .... 26. *thyrsoides.*
Folia linearia 3–4 lin. lata .... 27. *coarctatum.*
Filamenta alterna basi lanceolata haud cuspidata.
Grandifloræ foliis loratis.
Perianthii segmenta ubique alba .. 28. *arabicum.*

Perianthii segmenta basi brunnea . . 29. *revolutum.*
Parvifloræ foliis subteretibus.
Folia plura persistentia . . . . 30. *multifolium.*
Folia pauca carnoso-herbacea.
Folia 1–2 filiformia . . . . 31. *virgineum.*
Folia 3–4 lineari-subteretia . . . . 32. *rupestre.*

Subgenus III. Myogalum (Link). *Stamina hypogyna. Racemi oblongo-cylindrici. Perianthii segmenta omnia dorso late viridia marginibus angustis albidis.*

Folia 3–6 lin. lata . . . . 33. *nutans.*
Folia 9–12 lin. lata . . . . 34. *libanoticum.*

Subgenus IV. Beryllis (Salisb. extens.). *Stamina hypogyna. Racemi oblongo-cylindrici. Perianthii segmenta albida, rarissime fulva vel flavida, dorso anguste distincte viridi-vittata.*

Perianthium fulvum . . . . 35. *fuscatum.*
Perianthium sulphureum . . . . 42. *pyrenaicum,* var. *sulphureum.*

Perianthium album vel albidum.
Segmenta dorso uninervata. Bracteæ geminatæ. 36. *biflorum.*
Segmenta dorso paucinervata. Bracteæ solitariæ.
Folia lineari-subulata firma.
Pedicelli infimi floribus breviores.
Perianthium 3–4 lin. longum.
Folia setacea elongata . . . . . . 37. *niveum.*
Folia canaliculata brevia . . . . 38. *comptum.*
Perianthium 5–6 lin. longum . . 39. *graminifolium.*
Pedicelli floribus longiores . . . . . . 40. *juncifolium.*
Folia firma brevia linearia pilosa . . . . 41. *Bergii.*
Folia glabra carnoso-herbacea 1–2-pedalia.
Folia ante finem florationis evanida 42. *pyrenaicum.*
Folia ad finem florationis persistentia.
Filamenta alterna basi quadrata.
Pedicelli infimi 2–3 lin. longi 43. *virens.*
Pedicelli infimi 6–9 lin. longi 44. *caudatum.*
Filamenta basi linearia vel lanceolata.
Pedicelli infimi 1–3 lin. longi.
Folia ad scapum 2–3 . . . . . . 45. *sessiliflorum.*
Folia ad scapum 5–6 . . . . . . 46. *Eckloni.*

Pedicelli infimi 5–6 lin. longi 47. *scilloides.*
Pedicelli infimi 9–15 lin. longi.
Folia lanceolata 9–18 lin. lata.
48. *longebracteatum.*
Folia lorata 3–6 lin. lata .. 49. *narbonense.*
Folia oblonga 1–2 poll. longa.
Racemus laxe 4–8-florus .... 50. *crenulatum.*
Racemus dense 6–20-florus .... 51. *ovatum.*

Subgenus V. OSMYNE (Salisb. extens.). *Stamina hypogyna. Racemi ovato-deltoidei vel lanceolati. Perianthii segmenta lutea dorso anguste distincte viridi-vittata.*

Folia lineari-subulata facie profunde canaliculata.
Filamenta alterna bicuspidata .... 52. *vittatum.*
Filamenta integra basi linearia vel lanceolata.
Folia 1–2 .... 53. *barbatum.*
Folia plura .... 54. *tuberosum.*
Folia prope basin scapi superposita patentia.
55. *Bolusianum.*
Folia radicalia ascendentia lineari-lorata glabra.
Stylus 2–3 lin. longus ovario æquilongus.
Racemus laxe 6–12-florus.
Bracteæ 3–4 lin. longæ .... 56. *Kirkii.*
Bracteæ 8–12 lin. longæ .... 57. *suaveolens.*
Racemus dense 20–40-florus .... 58. *prasinum.*
Stylus ovarium duplo excedens.
Perianthium 8–9 lin. longum .... 59. *Melleri.*
Perianthium 15–16 lin. longum .... 60. *macranthum.*

Subgenus VI. CATHISSA (Salisb. extens.). *Stamina hypogyna. Racemi lanceolati vel cylindrici. Perianthii segmenta albida concoloria dorso haud vel vix vittata.*

Folia ascendentia lineari-subulata glabra.
Pedicelli infimi 2–3 lin. longi .... 61. *griseum.*
Pedicelli infimi 9–12 lin. longi .. .. 62. *Zeyheri.*
Folia prope basin scapi superposita patentia.
Bracteæ 1–2 lin. longæ.
Bracteæ cordato-deltoideæ cuspidatæ 63. *deltoideum.*
Bracteæ lineari-subulatæ .... 64. *pubescens.*
Bracteæ 4–6 lin. longæ.
Perianthium 4–5 lin. longum ...... 65. *pilosum.*

Perianthium 8–9 lin. longum ...... 66. *hispidum.*
Folia ascendentia glabra carnoso-herbacea.
Folium sæpissime solitarium.......... 67. *unifolium.*
Folia plura.
Perianthii segmenta 1½–2 lin. lata.
Folia anguste linearia........... 68. *tenellum.*
Folia late lorata .... 69. *latifolium.*
Perianthii segmenta 3–4 lin. lata.... 70. *lacteum.*

Subgenus VII. LEDEBOURIOPSIS (Baker). *Filamenta distincte perigyna. Perianthii segmenta, flore expanso, more* Ledebouriæ *supra basin falcata.*

Perianthium luteum dorso viridi-vittatum.
Folium teres serpentinum 1½–2-pedalis sæpissime solitarium.
71. *anomalum.*
Folia geminata linearia planiuscula .... 72. *Cooperi.*
Perianthium album dorso purpureo-vittatum.
73. *capitatum.*

Subgenus I. HELIOCHARMOS, *Baker.*

Racemi subcorymbosi vel late deltoidei scapis brevibus interdum subnullis. *Perianthii* segmenta sole fulgido tantum expansa, exteriora dorso viridia marginibus angustis albis, interiora dorso late viridi carinata. *Stamina* hypogyna, *filamentis* lanceolatis acuminatis subæqualibus segmentis subtriplo brevioribus. *Stylus* productus, 1–2 lin. longus.—Ornithogalum, *Salisb. Bulbus simplex* (*gemmam unicam centralem edens*) *vel bulbulis sub tunicis inclusis vel etiam bulbillis foliiferis liberis circumdatus. Formæ perplurimæ inter se arcte affines vix nisi sub cultura continua rectæ intelligendæ.*

1. O. COMOSUM, *Linn. Sp. Plant.* 440; *Jacq. Ic.* t. 426; *Kunth, Enum.* iv. 359; *Reich. Icones*, t. 1021; *Parl. Fl. Ital.* ii. 439; *Moggridge, Cont. Ment.* t. 67.—O. garganicum, *Tenore, Ind. Sem. Neap.* 1827, 3; *Fl. Neap.* iii. 371; *Kunth, Enum.* iv. 361. Bulbus ovoideus simplex 9–12 lin. crassus. Folia 5–6 ascendentia concoloria planiuscula demum 6–9 poll. longa, 4–6 lin. lata marginibus sæpissime obscure ciliatis. Scapus 3–6-pollicaris. Racemus 12–30-florus expansus late ovoideus, 2–4 poll. longus, 3–4 poll. latus, pedicellis infimis diutine ascendentibus. Bracteæ lineares acuminatæ, inferiores 15–18 lin. longæ. Perianthium 6–9 lin. longum segmentis 2–2½ lin. latis subobtusis. Filamenta 2½–3 lin. longa. Stylus 1 lin. longus. *Austria,*

Italia, Dalmatia, Macedonia.—O. contortum, *Ten. Fl. Neap.* t. 220, fig. 4; *Kunth, Enum.* iv. 362, est forma debilis pauciflora (*v. v. in Hort. Kew.*).

2. O. BREVIPEDICELLATUM, *Boiss. in Bourg. Pl. Lyciæ Exsic.* 1860, no. 264. Bulbus simplex ovoideus 6–9 lin. crassus. Folia 6–8 ascendentia 6–8 poll. longa, 1½–2 lin. lata glabra canaliculata vittata. Scapus 2–4-pollicaris. Racemus 2–6-florus densus oblongus pedicellis infimis arcuatis ascendentibus 2–4 lin. longis. Bracteæ lanceolatæ 6–9 lin. longæ. Perianthium 6–8 lin. longum segmentis oblongo-oblanceolatis obtusis mucronulatis 2–2½ lin. latis. Filamenta 3 lin. longa. Stylus 1 lin. longus. *Lycia in regione alpina,* Bourgeau! *Armenia,* Calvert!

3. O. LANCEOLATUM, *Labill. Pl. Rar. Syr.* dec. v. 11, t. 8; *Kunth, Enum.* iv. 360 (excl. planta euphratica). Bulbus simplex globosus 12–18 lin. crassus. Folia 4–5 falcata lanceolata 3–4 poll. longa, prope basin 6–12 lin. lata margine glabra haud vittata ad apicem acutum sensim angustata. Scapus brevissimus vel subnullus. Racemus corymbosus inverse deltoideus 6–12-florus expansus 2–3 poll. longus et latus pedicellis infimis erecto-patentibus 12–18 lin. longis. Bracteæ lanceolatæ acuminatæ 6–9 lin. longæ. Perianthium 6–10 lin. longum, segmentis 2–2½ lin. latis oblanceolatis obtusis cuspidatis. Filamenta 3–4½ lin. longa. *Syria,* Gaillardot! Lowne! Kotschy! *Asia minor,* Forbes! *Cyprus,* Kotschy, 707! *Mesopotamia,* Aucher-Eloy, 2142!

4. O. PLATYPHYLLUM, *Boiss. Diagn.* ser. 1, v. 64.—O. oligophyllum, *Clarke, Travels,* viii. 224? Folia glabra planissima glauca lanceolata acuta falcata scapo æquilonga ad pollicem latitudine attingentia. Scapus 3–4- vel plantæ cultæ 6-pollicaris. Racemus corymbosus pedicellis inferioribus elongatis bracteis acuminatis duplo longioribus. Perianthium circiter semipollicem longum segmentis ellipticis obtusis exterioribus brevissime mucronulatis. Filamenta segmentis triplo breviora. *Caria, in regione alpina,* Pinard (non vidi).

5. O. AUCHERI, *Boiss. Diagn.* ser. 1, v. 65; *Walp. Ann.* i. 858.—O. bifolium, *C. Koch, Linnæa,* xix. 10; *Walp. Ann.* iii. 633, non *Loddiges, Bot. Cab.* t. 1802.—O. pterocarpum, *Kotschy et Boiss. in Kots. Pl. Cilic.* 1859, no. 72. Bulbus simplex ovoideus 4–8 lin. crassus. Folia 2 opposita falcata basin scapi amplectentia matura 4–6 poll. longa, 3–6 lin. lata glabra concoloria obtusa facie canaliculata. Scapus 2–4-pollicaris. Racemi corymbosi 2–6-flori pedicellis erecto-patentibus infimis 6–12 lin. longis. Bracteæ lineares acuminatæ 9–15 lin. longæ. Perianthium 6–9 lin. longum segmentis obtusis 2–2½ lin. latis. Filamenta 2½–3 lin. longa. Stylus 1 lin. longus. *Asia minor,* Aucher-

Eloy, 5402! *Phrygia et Cilicia,* Balansa, 1320! Kotschy, 72! *Armenia,* Huet du Pavillon! Bourgeau, 249! *Constantinople,* Herb. Hook.—O. graciliflorum, *C. Koch, Linnæa,* xxii. 248; *Walp. Ann.* iii. 633, est verisimiliter forma ejusdem speciei; sed exemplum authenticum nondum vidi.

6. O. HUETII, *Boiss. Diagn.* ser. ii. 4, 108. Bulbus ovoideus simplex 5–6 lin. crassus. Folia 3–4 ascendentia basin scapi amplectentia anguste lorata 5–6 poll. longa, 4–5 lin. lata glabra concoloria apice cito, basi longe angustata. Scapus 3–4-pollicaris. Racemus 6–10-florus inverse deltoideis expansus 1½–2 poll. longus et latus pedicellis erecto-patentibus infimis 1½–2½ poll. longis. Bracteæ acuminatæ 12–15 lin. longæ. Perianthium 6–7 lin. longum segmentis subobtusis 2 lin. latis. Filamenta 2–2½ lin. longa. Stylus 1½–2 lin. longus. *Armenia, in paludosis,* Huet du Pavillon! *ad ripas fluminis Tigris ad Mossul,* Loftus!

7. O. MONTANUM, *Cyrillo in Ten. Prod.* 22; *Flor. Neap.* i. 176, t. 33; *Bot. Reg.* 1838, t. 28; *Sweet, Flor. Gard.* ser. ii. t. 42? *Kunth, Enum.* iv. 360; *Reich. Icones,* t. 1025.—O. patulum, *Raf. in Desv. Journ. Bot.* iv. 271. Bulbus ovoideus simplex 9–12 lin. crassus. Folia 5–6 linearia, 5–6 poll. longa, 4–6 lin. lata falcata planiuscula concoloria marginibus glabris. Scapus 2–4-pollicaris. Racemus 6–20-florus subcorymbosus expansus 3–4 poll. longus et latus, pedicellis diutine ascendentibus infimis 2-3 poll. longis. Bracteæ lineares 12–15 lin. longæ. Perianthium 6–9 lin. longum segmentis oblanceolatis acutis 1½–2 lin. latis. Filamenta 2–2½ lin. longa. Stylus 1 lin. longus. *Italia, Sicilia.*

8. O. CUSPIDATUM, *Bert. Fl. Ital.* iv. 99 (1839); *Nov. Comm.* v. 429, t. 42; *Gris. Fl. Rum.* 392.—O. marginatum, *Lindl. Bot. Reg.* xxxi. t. 21.—O. lanceolatum, *Kth.,* quoad plantam euphraticam.—O. byzantinum, *Hort.* Bulbus ovoideus simplex 15–18 lin. crassus. Folia 5–6 linearia demum 10–12 poll. longa medio 6–8 lin. lata pallide viridia concoloria planiuscula marginibus glabris anguste pellucidis. Scapus validus 3–5-pollicaris. Racemus 12–20-florus corymbosus, expansus 4–6 poll. latus, pedicellis omnibus diutine ascendentibus infimis 3–4 poll. longis. Bracteæ acuminatæ 1½–2-pollicaris. Perianthium 8–9 lin. longum segmentis exterioribus 2½–3 lin. latis oblongo-oblanceolatis obtusis cuspidatis. Filamenta 3–4 lin. longa. Stylus 1 lin. longus. *Asia Minor,* Herbert (*v. v. in Hort. Kew.*). *Syria,* Haussknecht! *Ad ripas fluminis Euphratis,* Chesney, 84! 107! Ad *O. montanum* proxime accedit.

9. O. SORORIUM, *Schott et Kotschy, Œstr. Bot. Wochen.* 4. Jahr. iii. 105; *Tchih. Asia Minor,* ii. 545. Folia circiter 5 lineari-lanceolato-linguiformia glabra canaliculata. Scapus nullus. Racemi subcorym-

bosi pedicellis infimis subpollicaribus arrectis. Bracteæ lanceolatæ pedicellos superantes. Perianthium apertum diametro 1½ poll. et ultra, segmentis exterioribus 2½–3 lin. latis. Filamenta segmentis subtriplo breviora. *Cilicia ad montes Taurus,* Kotschy (non vidi).

10. O. TENUIFOLIUM, *Guss. Prodr.* i. 413; *Reich. Icones,* t. 1020; *Parl. Fl. Ital.* ii. 442, non *Red. Lil.* t. 312.—O. Gussonii, *Ten. Fl. Neap.* iii. 337, t. 226. fig. 1; *Kunth, Enum.* iv. 364. Bulbus ovoideus simplex 12–15 lin. crassus. Folia 5–6 planiuscula angustissime linearia 5–6 poll. longa, 1–2 lin. lata glabra concoloria. Scapus 2–3-pollicaris. Racemus 6–12-florus corymbosus expansus 2–3 poll. longus et latus, pedicellis erecto-patentibus infimis 15–18 lin. longis. Perianthium 6–7 lin. longum segmentis 1½–2 lin. latis exterioribus obtusiusculis. Filamenta 2–2½ lin. longa. Stylus 1 lin. longus. *Gallia meridionalis, Italia, Sicilia, Græcia* (*v. v. in Hort. Kew.*).—O. trichophyllum, *Boiss. et Held. Diagn.* ser. 2, iv. 108, planta ægyptiaca, et O. pedicellare, *Boiss. et Kots. in Sched. Kots. Pl. Cilic. Kurd.* no. 142, ex insula Cypro, non potui separare.

11. O. ORTHOPHYLLUM, *Tenore, Syll.* 594; *Fl. Neap.* t. 225; *Kunth, Enum.* iv. 361; *Parl. Fl. Ital.* ii. 444. Bulbus simplex ovoideus 12–15 lin. crassus. Folia 6–7 linearia canaliculata glabra vittata 6–8 poll. longa, 6–7 lin. lata primum suberecta. Scapus 2–4-pollicaris validus. Racemi 10–12-flori subcorymbosi expansi 3–4 poll. longi et lati pedicellis diutine ascendentibus infimis 1½–2 poll. longis. Bracteæ lanceolatæ acuminatæ 15–18 lin. longæ. Perianthium 7–8 lin. longum segmentis 2–2½ lin. latis exterioribus obtusis mucronulatis. Filamenta 2½–3 lin. longa. Stylus 1–1½ lin. longus. *Italia.*—O. algeriense, *Jord. et Four. Brev.* 52, Icones, t. 121 (*Algeria*). O. Bourgæanum, *Jord. et Four. Brev.* 52, Icones, t. 130; et O. acuminatum, *Schur, Fl. Transy.* 664, non *Baker* (*Transylvania*) sunt formæ simillimæ.—O. etruscum, *Parl. Fl. Ital.* ii. 443, ex descriptione, vix differt nisi bulbo prolifero.—O. bæticum, *Boiss. Elench.* 84, forma hispanica, est verisimiliter ad *O. orthophyllum* adscribendum.

12. O. COLLINUM, *Guss. Prodr.* i. 412; *Kunth, Enum.* iv. 361; *Parl. Fl. Ital.* ii. 441; *Reich. Ic.* t. 1022.—O. saxatile, *Vis. Bot. Zeit.* 1829; *Erganz. Bl.* 10.—O. Kochii, *Parl. Fl. Ital.* ii. 441. Bulbus simplex ovoideus 9–12 lin. crassus. Folia 6–8 primum suberecta 6–7 poll. longa angustissime linearia 1–1½ lin. lata canaliculata ciliata facie vittata. Scapus 2–4-pollicaris gracilis. Racemus 6–10-florus expansus 2–3 poll. longus et latus pedicellis diutine ascendentibus infimis 1½–2 poll. longis. Bracteæ lineares acuminatæ, infimæ 9–12 lin. longæ. Perianthium 6–7 lin. longum segmentis exterioribus 2 lin. latis obtusis, mucronatis. Filamenta 2–2½ lin. longa. Stylus 1 lin. longus. *Sicilia, Italia, Dalmatia.*

13. O. ANGUSTIFOLIUM, *Boreau, Fl. Cent.* edit. iii. 625; *Jord. et Fourr. Icones,* 29, t. 117. Bulbus ovoideus 5–6 lin. crassus bulbillis foliiferis paucis circumdatus. Folia 5–6 suberecta angustissima subteretia glabra 6–9 poll. longa, 1–1½ lin. lata facie canaliculata vittata. Scapus 3–4-pollicaris. Racemus corymbosus 4–6-florus pedicellis erecto-patentibus inferioribus 12–15 lin. longis. Bracteæ lanceolatæ acuminatæ 8–9 lin. longæ. Perianthium 5–6 lin. longum segmentis inæquilongis oblongo-oblanceolatis subobtusis 1½–2 lin. latis. Filamenta 2 lin. longa. Stylus 1 lin. longus. *Gallia occidentalis.*—O. parviflorum, *Jord. et Four. Ic.* t. 119, est forma affinis e Gallia orientali bulbo majore racemo laxiore 10–12-floro pedicellis minus ascendentibus infimis 1½–2 poll. longis perianthio minimo omnium.

14. O. MONTICOLUM, *Jord. et Fourr. Brev.* 54, *Icones,* t. 129.—O. subalpinum, *Gay, Herb.*—O. tenuifolium, *Gren. Fl. France,* iii. 191, ex parte. Bulbus ovoideus 1 poll. crassus, bulbulis interdum in tunicis inclusis. Folia 5–6 glaberrima 6–9 poll. longa, 1½–2 lin. lata canaliculata vittata, ad basin angustissimum sensim attenuata. Scapus 4–6-pollicaris. Racemus subcorymbosus 6–10-florus expansus 2–3 poll. longus et latus, pedicellis gracilibus erecto-patentibus infimis 1½–2 poll. longis. Perianthium 6–7 lin. longum segmentis 1½–2 lin. latis extimis obtusiusculis mucronulatis. Filamenta 2–2½ lin. longa. Stylus 1 lin. longus. *Alpes Delphinati et Sabaudiæ,* Gay!—O. alpestre, *Jord. et Four. Brev.* 53, *Icones,* t. 123; O. rigidulum, *Jord. et Four. Brev.* 53, *Icones,* t. 127; et O. propinquum, *Jord. et Four.* 53, *Ic.* t. 122, sunt formæ arctissime affines ejusdem regionis.

15. O. UMBELLATUM, *L. Sp. Plant.* 441: *Jacq. Austr.* t. 343; *Eng. Bot.* t. 130; *Red. Lil.* t. 143; *Fl. Dan.* t. 1266; *Curt. Flor. Lond.* t. 45; *Kunth, Enum.* iv. 362; *Reich. Icones,* t. 1019.—O. hortense, *Jord. et Four. Brev.* 54, *Icones.* t. 116. Bulbus subglobosus 12–15 lin. crassus bulbulis copiosis instructus. Folia 6–9 ascendentia anguste linearia 6–12 poll. longa, 2–4 lin. lata glabra profunde canaliculata facie distincte albido-vittata. Scapus 4–6-pollicaris. Racemus subcorymbosus 12–20-florus, expansus 4–6 poll. longus, 6–9 poll. latus pedicellis infimis patentibus 2–4 poll. longis. Bracteæ lineares acuminatæ 12–18 lin. longæ. Perianthium 9–10 lin. longum segmentis exterioribus obtusis mucronulatis 2–2½ lin. latis. Filamenta 3–3½ lin. longa. Stylus 1½ lin. longus. *Per totam Europam ex Norvegia et Anglia ad Algeriam, Palæstinam, et Armeniam.*—O. ruthenicum, *Bouché in Kunth, Enum,* iv. 363, est planta affinis foliis angustioribus bulbo simplici. O. Joannoni, *Jord. et Four. Brev.* 54, *Icones,* t. 128, differt bulbo ovoideo sæpissime simplici; O. minus, *Linn. Mant.* 364, O. prætextum, *Stev. in Kunth, Enum.* iv. 363, O. Boræanum, *Jord. et Four. Ic.* t. 131, O. affine, *Boreau, Fl. du Cent.*

edit. 3, 625, *Jord. et Four. Ic.* t. 124, O. rusticum, *Jord. et Four. Brev.* 55, O. cæspititium, *Jord. et Four. Brev.* 57, et O. tardans, *Jord. et Four. Ic.* t. 120, sunt plantæ simillimæ bulbis bulbilliferis foliis angustioribus; et O. nivale, *Boiss. Diagn.* v. 65, *Walp. Ann.* i. 858, est verisimiliter forma nana alpina.

16. O. PATERFAMILIAS, *Godr. Not. Fl. Monsp.* 27; *Gren. Fl. France*, iii. 190; *Walp. Ann.* vi. 117. Bulbus globosus 12–15 lin. crassus bulbillis numerosis sub tunicis inclusis et bulbulis foliiferis copiosis circumdatus. Folia plura corymbum eminentia 6–8 poll. longa, 1–1½ lin. lata glabra canaliculata concoloria. Scapus 3–4-pollicaris. Racemus 10–15-florus expansus 3–4 poll. longus et latus, pedicellis infimis 1½–2 poll. longis demum deflexis. Bracteæ acuminatæ 15–18 lin. longæ. Perianthium 8–9 lin. longum segmentis 2–2½ lin. latis acutiusculis. Filamenta 2½–3 lin. longa. Stylus 1½ lin. longus. *Gallia meridionalis*, Godron!

17. O. REFRACTUM, *Kit. in Willd. Enum. Suppl.* 18; *Reich. Ic. Crit.* t. 142; *Flor. Germ.* t. 1024; *Sweet, Flow. Gard.* ser. 2, t. 58; *Kunth, Enum.* iv. 364, non *Tenore, Flor. Neap.* t. 225. fig. 1. Bulbus ovoideus proliferus 12–15 lin. crassus. Folia 6–8 racemum longe superantia primum ascendentia anguste linearia 6–9 poll. longa, 1–1½ lin. lata glabra vittata canaliculata. Scapus 2–4-pollicaris. Racemus 5–15-florus expansus 2–3 poll. longus et latus, pedicellis infimis demum deflexis 9–12 lin. longis. Bracteæ lineares acuminatæ pedicellis inferioribus æquilongæ. Perianthium 6–8 lin. longum, segmentis 1½–2 lin. latis exterioribus oblanceolatis obtusiusculis. Filamenta 2–2½ lin. longa. Stylus 1½ lin. longus. *Hungaria*, Lang! Sadler et Pauer! etc.

18. O. DIVERGENS, *Boreau, Fl. Cent.* edit. 3, 625; *Gren. Fl. France*, iii. 190; *Parl. Fl. Ital.* ii. 436; *Jord. et Four. Icones*, t. 125.—O. refractum, *Guss. Fl. Sic. Suppl.* 101; *Ten. Fl. Neap.* t. 225. fig. 1, non *Kit.* Bulbus subglobosus 15–18 lin. crassus bulbillis numerosis sub tunicis inclusis. Folia 6–8 racemum paulo superantia 8–12 poll. longa, 2–3 lin. lata glabra facie albido-vittata late canaliculata. Scapus 3–6-pollicaris. Racemus 12–20-florus expansus, 5–6 poll. longus et latus pedicellis infimis 2–3 poll. longis demum deflexis. Bracteæ lanceolatæ acuminatæ infimæ 1½–2 poll. longæ. Perianthium maximum specierum omnium hujus stirpis, 9–12 lin. longum, segmentis 3–4 lin. latis obtusiusculis. Filamenta 4–4½ lin. longa. Stylus 1½–2 lin. longus. *Gallia, Italia, Germania australis, Sicilia.*—O. proliferum, *Jord. et Four. Brev.* 57, *Ic.* t. 118, et O. declinatum, *Jord. et Four. Brev.* 57, *Ic.* t. 126, sunt formæ simillimæ.

19. O. ÆMULUM, *Schott et Kotschy, Œst. Bot. Wochen.* 4. Jahr. xiii. 162; *Tchih. Asia Minor*, ii. 545; *Walp. Ann.* vi. 118. Folia 2 late linearia glauco-viridia glabra erecta. Scapus brevis sæpe subnullus.

Corymbi rachis 2–3-pollicaris floribus remotis pedicellis infimis demum deflexis bracteis duplo longioribus. Filamenta segmentis duplo breviora alterna duplo angustiora. *Olympus Bithyniæ* (non vidi).

20. O. FIMBRIATUM, *Willd. Nova Acta Ber.* 3; *M. Bieb. Flor. Taur.* i. 276; *Bot. Reg.* t. 555; *Lindl. Coll. Bot.* vi. t. 8; *Hook. Bot. Mag.* t. 3077; *Sweet. Flor. Gard.* t. 111 (mala); *Kunth, Enum.* iv. 362.—O. Roegnerianum, *C. Koch, Linn.* xxii. 246; *Walp. Ann.* iii. 633. Bulbus ovoideus 9–15 lin. crassus haud proliferus. Folia 6–8 corymbum longe eminentia 6–8 poll. longa, 3–4 lin. lata pallide viridia concoloria facie concava ubique dense pilosa. Scapus pilosus 1–2-pollicaris vel sæpe subnullus. Racemus corymbosus 8–20-florus expansus 2–3 poll. latus pedicellis infimis fructiferis deflexis 9–12 lin. longis. Bracteæ lineares 6–9 lin. longæ. Perianthium 6–8 lin. longum segmentis 1½–2 lin. latis obtusiusculis. Filamenta 2–2½ lin. longa. Stylus 1½ lin. longus. *Tauria, Bryzantium, Asia minor, Syria.*

21. O. EXSCAPUM, *Tenore, Fl. Neap.* i. 175, t. 34; *Kunth, Enum.* iv. 365; *Reich. Ic.* t. 1023; *Parl. Fl. Ital.* ii. 437; *Gren. Fl. Franc.* iii. 190; *Mog. Cont. Ment.* t. 68.—O. pauciflorum, *Raf. Précis*, 44.—O. mutabile, *De Not. Fl. Lig.* 407.—O. Bertolonii, *Jord. et Four. Brev.* 58.—O. biflorum, *Jord. et Four. Brev.* 58. Bulbus ovoideus 9–12 lin. crassus haud proliferus. Folia 5–6 corymbo duplo superantia 4–6 poll. longa glabra facie concava anguste vittata 1–2 lin. lata post anthesin evanescentia. Scapus 1–1½-pollicaris. Racemus 3–12-florus expansus 2½–3 poll. latus pedicellis infimis fructiferis decurvatis 15–18 lin. longis. Bracteæ lanceolatæ 8–12 lin. longæ. Perianthium 6–8 lin. longum segmentis 1½–2 lin. latis subobtusis. Filamenta 2–2½ lin. longus. Stylus 1½ lin. longus. *Corsica, Sicilia, Sardinia, Italia, Dalmatia, Rumelia.* O. biflorum, *J. & F.*, est forma parva corsicana 2–3-flora foliis parvis angustioribus.

22. O. CYDNI, *Schott et Kotschy, Œstr. Bot. Wochen.* 4. Jahr. xiii. 153; *Tchih. Asia Minor*, ii. 546; *Walp. Ann.* vi. 118. Folia circiter 5 oblanceolato-linearia glauca glabra profunde canaliculata. Scapus subnullus. Racemi subcorymbosi pedicellis demum refractis bracteas lineari-lanceolatas superantibus. Perianthium expansum vix ultra 1 poll. diametro. Filamenta segmentis subduplo breviora. *Cilicia, Taurus ad fontes Cydni,* Kotschy (non vidi).

23. O. NANUM, *Sibth. et Sm. Fl. Græc.* iv. 28, t. 332; *Kunth, Enum.* iv. 365; *Griseb. Fl. Rumel.* ii. 392. Bulbus subglobosus 8–12 lin. crassus haud proliferus. Folia 5–6 corymbum longe eminentia 3–4 poll. longa, 1½–2 lin. lata glabra concoloria facie canaliculata. Scapus brevissimus vel subnullus. Racemus 3-10-florus expansus 1½–2 poll. latus pedicellis infimis arcuato-deflexis 6–8 lin. longis. Bracteæ lanceolatæ acuminatæ infimæ 9–12 lin. longæ. Perianthium

6–8 lin. longum, segmentis 1½–2 lin. latis subacutis. Filamenta 2–2½ lin. longa. Stylus 1–1½ lin. longus. *Thracia, Rumelia, Græcia, Asia Minor,* Aucher-Eloy, 2145! Noe, 362 (sub nomine *O. pusilli,* Lehm)! etc.

Subgenus II. CARUELIA (*Parl.*).

Racemi subcorymbosi vel late deltoidei scapis brevibus vel elongatis validis. *Perianthii* segmenta flore expanso plus minus incurvata, dorso nullo modo viridia, albida vel interdum flavida vel miniata, omnino concoloria vel apice vel basi brunneo- vel nigro-maculata. Stamina hypogyna, filamentis alternis sæpissime latioribus interdum basi quadrangulari-dilatatis bicuspidatis. *Stylus* brevissimus vel subnullus.—Myanthe, Phæocles, et Aspasia, ex parte, *Salisb.*

24. O. THUNBERGIANUM, *Baker* (non O. Thunbergii, *Kunth, Enum.* iv. 369).—O. maculatum, *Thunb. Prodr.* 62; *Flor. Cap.* 314; *Kunth, Enum.* iv. 352, non *Jacq.* Bulbus globosus 5–6 lin. crassus. Folia 3–4 carnoso-herbacea glabra linearia 3–4 poll. longa basin scapi amplectentia. Scapus 3–6-pollicaris. Racemi 2–6-flori corymbosi, pedicellis brevibus, bracteis lanceolatis 3–4 lin. longis. Perianthium 5–6 lin. longum segmentis flavidis obovatis obtusis late imbricatis 2 lin. latis exterioribus tertio superiore distincte nigro-maculatis. Filamenta 2 lin. longa, alterna lanceolata et subulata. Stylus subnullus. *Cap. B. Spei,* Thunberg! Drege, 8668!

25. O. MACULATUM, *Jacq. Coll.* ii. 368, t. 18. fig. 3 (1789); *Poir. Encyc.* iv. 615, non *Thunb.*—O. notatum, *Schult. fil. Syst. Veg.* vii. 528; *Kunth, Enum.* iv. 352.—Phæocles maculata, *Salisb. Gen.* 35. Bulbus globosus 8–9 lin. crassus. Folia 4–5 carnoso-herbacea glabra linearia 3–4 poll. longa, 2½–3 lin. lata facie canaliculata basin scapi amplectentia. Scapus 2–3-pollicaris. Racemus 2–4-florus subcorymbosus, pedicellis brevibus ascendentibus, bracteis lanceolatis. Perianthium croceum 5–6 lin. longum segmentis ovatis acutis 2–2½ lin. latis exterioribus sub apicem obscure brunneo-maculatis. Filamenta æqualia filiformia 2 lin. longa. Stylus subnullus. *Cap. B. Spei.*

26. O. THYRSOIDES, *Jacq. Vind.* iii. 17, t. 28; *Thunb. Prodr.* 62; *Fl. Cap.* 315; *Miller, Icones,* t. 192; *Bot. Mag.* t. 1164; *Red. Lil.* t. 333; *Kunth, Enum.* iv. 353; *Saund. Ref. Bot.* t. 20.—O. arabicum, *Linn. Sp. Plant.* 441 ex parte.—O. Grimaldiæ, *Nocca, Pl. Select. Tic.* t. 4.—Aspasia thyrsoides, *Salisb. Gen.* 34. Bulbus globosus 1½–2 poll. crassus. Folia 5–6 carnoso-herbacea viridia ascendentia lanceolata 6–12 poll. longa deorsum 1–2 poll. lata falcata ad apicem acutum sensim angustata marginibus obscure ciliatis. Scapus validus

teres erectus 6-18-pollicaris. Racemi 12–30-flori densi, deltoidei expansi 3–4 poll. lati. Pedicelli diutine ascendentes, inferiores 1½–2 poll. longæ. Bracteæ lanceolatæ membranaceæ persistentes 9–12 lin. longæ. Perianthium 6–9 vel in planta culta 12 lin. longum segmentis ovatis valde imbricatis subobtusis 4–6 lin. latis albis unguibus flavido-fuscescentibus. Filamenta 2–3 lin. longa, alterna longiora lanceolata, alterna breviora supra basin dilatata bicuspidata. Stylus cylindricus brevissimus. *Cap. B. Spei*, Zeyher, 4201! Ecklon, 22! 572! Burchell, 6197! etc.

Var. β. AUREUM, *Ait. Hort. Kew.* 442.—O. aureum, *Curt. Bot. Mag.* t. 190; *Red. Lil.* t. 439; *Kunth, Enum.* iv. 352.—O. dubium, *Houtt. Pfl. Syst.* xi. 347, t. 82. fig. 3.—O. bicolor, *Haw. Misc.* 24; *Kunth, Enum.* iv. 347. Perianthium aureum. *Cap. B. Spei*, Burchell, 6198! Ecklon, 572! Zeyher, 4201!—O. flavissimum, *Jacq. Ic.* t. 436; *Andr. Bot. Rep.* t. 505, est forma floribus saturate flavis; O. flavescens, *Jacq. Ic.* t. 437; *Bot. Reg.* t. 305, floribus croceis; et O. miniatum, *Jacq. Ic.* t. 438; *Kunth, Enum.* iv. 352, floribus miniatis.

27. O. COARCTATUM, *Jacq. Icones*, t. 435; *Willd. Sp. Plant.* ii. 125; *Schultes, fil. Syst. Veg.* vii. 511; *Kunth, Enum.* iv. 353. Bulbus globosus 9–12 lin. crassus. Folia 4–5 carnoso-herbacea erectiuscula linearia 8–12 poll. longa, 3–4 lin. lata glabra viridia. Scapus firmus 12–18-pollicaris. Racemi dense 12–30-flori deltoidei expansi 2½–3 poll. lati. Pedicelli erecto-patentes, infimi 12–15 lin. longi. Bracteæ lanceolatæ persistentes 8–12 lin. longæ. Perianthium album inodorum 6–7 lin. longum segmentis oblongo-lanceolatis subacutis 2–2½ lin. latis unguibus flavescentibus. Stamina 2 lin. longa, alterna longiora lanceolata, alterna breviora basi quadrangularia obscure cuspidata. Stylus 1–1½ lin. longus filiformis. *Cap. B. Spei*, Zeyher, 1679! *Hort. Kew.* anno 1861 cult.!

28. O. ARABICUM, *Linn. Sp. Plant.* 441 ex parte; *Bot. Mag.* t. 728; *Kunth, Enum.* iv. 353; *Reich. Icones*, t. 1026; *Gren. Flor. France*, iii. 192.—Caruelia arabica, *Parl. Nuov. Gen.* 22; *Fl. Ital.* ii. 451.—Myanthe arabica, *Salisb. Gen.* 34.—O. corymbosum, *Ruiz et Pavon, Fl. Peruv.* iii. 68, t. 30; *Lindl. Bot. Reg.* t. 906; *Bot. Mag.* t. 3179; *Kunth, Enum.* iv. 354.—O. aridum, *Pœpp. Fragm.* 9; *Kunth, Enum.* iv. 683. Bulbus ovoideus 15–18 lin. crassus proliferus. Folia 5–8 lorata carnoso-herbacea glauco-viridia 12–18 poll. longa, 9–12 lin. lata, glabra, primum suberecta, demum patentia. Scapus validus teres 1–2-pedalis. Racemi 6–12-flori, expansi rotundati vel deltoidei 3–5 poll. longi et lati. Pedicelli inferiores 1½–3 poll. longi primum ascendentes. Bracteæ lanceolatæ acuminatæ 9–12 lin. longæ membranaceæ persistentes. Perianthium album erectum odorum 9–12 lin. longum segmentis ovatis concoloribus 3–4 lin. latis interioribus subobtusis exterioribus obtusioribus apice distincte cuspidatis. Filamenta 3–4 lin.

longa lanceolata acuminata, alterna distincte latiora. Stylus ½–1 lin. longus. Stigma amplum trilobum. *Ab Hispania et insulis Fortunatis ad Græciam et Ægyptum.* O. corymbosum, *R. et P.*, est forma magna hortensis perianthio 15–16 lin. longo segmentis 6–7 lin. latis in Chili introducta.

29. O. REVOLUTUM, *Jacq. Schœn. t. 89; Gawl. Bot. Mag. t. 653; Bot. Reg.* t. 315; *Kunth, Enum.* iv. 354. Bulbus globosus 9–12 lin. crassus. Folia 4–5 carnoso-herbacea lorata 6–9 poll. longa, 6–9 lin. lata inferne canaliculata. Scapus firmus 8–12-pollicaris. Racemus 12–20-florus expansus deltoideus 3–4 poll. longus et latus. Pedicelli erecto-patentes, infimi 12–18 poll. longi. Bracteæ lanceolatæ, infimæ 9–12 lin. longæ. Perianthium 6–9 lin. longum segmentis albis oblongis obtusis 2½ lin. latis flore expanso recurvatis basi brunneo tinctis. Filamenta 2½–3 lin. longa, alterna subulata, alterna basi lanceolata obscure cuspidata. Stylus vix 1 lin. longus. *Cap. B. Spei*, Whitehead! etc.

30. O. MULTIFOLIUM, *Baker.* Folia 10–12 carnoso-coriacea erectiuscula filiformia persistentia 2–3 poll. longa. Scapus 3–6-pollicaris. Racemus dense 12–25-florus subcorymbosus. Pedicelli infimi arcuato-ascendentes 9–12 lin. longi. Bracteæ lineares acuminatæ, infimæ 6–9 lin. longæ. Perianthium album 5–6 lin. longum segmentis ovato-lanceolatis concoloribus 2–2½ lin. latis. Filamenta lanceolata subæqualia 2 lin. longa. Stylus brevissimus. *Cap. B. Spei in ditione Namaquensi*, Rev. H. Whitehead!

31. O. VIRGINEUM, *Soland. in Herb. Mus. Brit.* Bulbus ovoideus 4–5 lin. crassus. Folia 1–2 filiformia carnosa subteretia glabra 15–18 lin. longa. Scapus 6–12 lin. longus. Racemus 3–5-florus subcorymbosus pedicellis arcuatis ascendentibus exterioribus 2–3 lin. longis. Bracteæ lanceolatæ 3 lin. longæ. Perianthium albidum, 2½–3 lin. longum segmentis ovatis subobtusis concoloribus 1¼ lin. latis. Filamenta lanceolata 1–1½ lin. longa. Stylus brevissimus. *Cap. B. Spei*, Masson!

32. O. RUPESTRE, *Linn. Suppl.* 199; *Thunb. Prodr.* 61; *Fl. Cap.* 313; *Kunth, Enum.* iv. 367. Bulbus ovoideus 4–6 lin. crassus. Folia 3–4 carnoso-herbacea lineari-subteretia 2–3 poll. longa glabra basi dilatata scapum amplectentia suberecta. Scapus 1–4-pollicaris gracilis flexuosus. Racemus subcorymbosus 2–6-florus pedicellis ascendentibus 2–4 lin. longis. Bracteæ lanceolatæ persistentes 3–4 lin. longæ. Perianthium 3–4 lin. longum segmentis albidis concoloribus ovati obtusis valde imbricatis 2 lin. latis. Filamenta 1–1½ lin. longa lanceolata, alterna latiora. Stylus subnullus. *Cap. B. Spei*, Thunberg! Masson! Drege, 1512! 2662–3!

Subgenus III. Myogalum (*Link*).

Racemi 6–20-flori oblongo-cylindrici pedicellis brevibus inferioribus cernuis. *Perianthii* segmenta magna, flore expanso incurvata, dorso omnia late viridia marginibus angustis albidis. *Stamina* hypogyna filamentis late petaloideis inæqualibus, longioribus segmentis duplo brevioribus, alternis vel sæpissime omnibus apice conspicue tricuspidatis cuspide intermedio antherifero. *Stylus* filiformis ovario æquilongus.—Albucea, *Reich.*—Brizophile, *Salisb.*

33. O. nutans, *Linn. Sp. Plant.* 441; *Jacq. Austr.* t. 301; *Bot. Mag.* t. 269; *Fl. Dan.* t. 912; *Eng. Bot.* t. 1997; *Curt. Fl. Lond.* t. 44.—Myogalum nutans, *Link, Handb.* i. 164; *Kunth, Enum.* iv. 348.—Albucea nutans, *Reich. Fl. Excurs.* 110. Bulbus ovoideus 12–18 lin. crassus abunde soboliferus. Folia 4–6 lorata flaccida pallide viridia 12–18 poll. longa, 3–6 lin. lata glabra post anthesin evanescentia. Scapus 8–12-pollicaris. Racemus sublaxe 3–12-florus expansus 3–5 poll. longus floribus inferioribus cernuis subsecundis. Pedicelli inferiores 3–6 lin. longi. Bracteæ lanceolatæ acuminatæ 12–15 lin. longæ. Perianthium 10–12 lin. longum, segmentis oblongo-lanceolatis subacutis 3–4 lin. latis, albo-marginatis. Filamenta petaloidea valvata interne ad medium angulo longitudinali valde prominente apice edentulo instructa, alterna segmentis duplo breviora, $1\frac{1}{2}$–2 lin. longa, dentibus lateralibus antheris æquilongis, alterna segmentis triplo breviora, apice quadrangularia breviter bicuspidata. Stylus $2\frac{1}{2}$–3 lin. longus, ovario æquilongus. Capsula late ovoidea apice profunde umbilicata. *Ex Oriente allatum nunc per Europam totam inquilinum.*

Var. *β*. Boucheanum, *Baker.*—Myogalum Boucheanum, *Kunth, Enum.* iv. 348.—Ornithogalum Boucheanum, *Aschers, Verh. bot. Ver. Brand.* 1866, 13.—O. chloranthum, *Sauter, in Koch, Taschen.* 508; *Flora,* 1845, i. 131.—Albucea chlorantha, *Reich. Icones,* t. 1032.—Racemus densior floribus magis approximatis et patentibus. Filamenta interne ad medium secundum longitudinem angulo valde prominente apice dentiformi instructa et dentibus longiorum antheris brevioribus. Capsula apice haud umbilicata seminibus duplo minoribus. *Asia minor* Bourgeau! et late per Germaniam inquilinum. M. affine, *C. Koch et Bouche, Ind. Sem. Berol.* 1855, p. 10, est forma inter *α* et *β* intermedia.

Var. *γ*. prasandrum, *Baker.*—O prasandrum, *Griseb. Fl. Rumel.* 390.—Myogalum Thirkeanum, *C. Koch, Linnæa,* xix. 11. Gracilior foliis angustioribus perianthii segmentis lanceolatis acutis $1\frac{1}{2}$–2 lin. latis, filamentis margine vix valvatis, brevioribus linearibus integris. *Asia minor,* Grisebach, Fleischer! Aucher-Eloy, 2141! *Græcia,* Von Heldreich. Verisimiliter forma sylvestris speciei.

34. O. LIBANOTICUM, *Bois. Diagn.* ser. 2, iv. 106. Bulbus ovoideus haud proliferus. Folia lorata glabra scapo longiora 9–12 lin. lata. Scapus subpedalis. Racemus densiusculus semipedalis, pedicellis erecto-patulis flore 2–3-plo brevioribus, bracteis scariosis lanceolatis acuminatis flore vix brevioribus. Perianthium 10–12 lin. longum segmentis oblongis obtusis obsolete viridi-fasciatis. Filamenta perianthio tertia parte breviora, alterna simplicia et bicuspidata. *Syria, Libanus,* Reygasse et Blanche (non vidi).

Subgenus IV. BERYLLIS (*Salisb. extens.*).

Racemi 3–100-flori expansi lanceolati vel subcylindrici. *Perianthii* segmenta alba (vel in sp. 35 fulva) dorso distincte anguste viridi-, deinde fusco-vittata, venis sæpissime 3–4 parallelis confertis, flore expanso rotata vel leviter recurvata. *Filamenta* hypogyna segmentis subduplo breviora. *Stylus* ovario æquilongus vel brevior.—Beryllis, Eustachys, ex parte, Ardernia, et Urophyllon, *Salisb. Gen.* 33–36.

35. O. FUSCATUM, *Jacq. Ic.* t. 429; *Schult. fil. Syst.* vii. 523: *Kunth, Enum.* iv. 366.—Ardernia fuscata, *Salisb. Gen.* 35. Bulbus subglobosus 1 poll. crassus. Folia 2–3-linearia carnoso-herbacea glabra nitida 3–4 poll. longa, 3–4 lin. lata. Scapus gracilis 6–12-pollicaris. Racemus 12–20-florus expansus lanceolatus, 3–5 poll. longus, 15–18 lin. latus. Pedicelli ascendentes, 4–6 lin. longi. Bracteæ lanceolatæ acuminatæ 3–4 lin. longæ. Perianthium inodorum 4–5 lin. longum segmentis oblongis obtusis 1½ lin. latis fulvis viridi-vittatis flore expanso rotatis. Filamenta linearia segmentis duplo breviora alterna latiora. Stylus ovario æquilongus. *Cap. B. Spei.*

36. O. BIFLORUM, *D. Don in Sweet, Flow. Gard.* ser. 2, t. 246.—Scilla biflora, *Ruiz et Pavon, Fl. Peruv.* iii. 69, t. 302; *Kunth, Enum.* iv. 325.—Ornithogalum geminiflorum, *Herbert, Bot. Reg.* 1838, *Misc.* no. 100.—Scilla geminiflora, *Kunth, Enum.* iv. 325. Bulbus globosus 9–15 lin. crassus. Folia 4–6 carnoso-herbacea linearia glabra facie concava ad apicem acutum sensim attenuata 6–12 poll. longa, 3–6 lin. lata. Scapus 6–12-pollicaris. Racemus laxe 6–20-florus expansus 3–4 poll. longus, 1½–2 poll. latus. Pedicelli stricti erecto-patentes infimi geminati 12–18 lin. longi. Bracteæ lanceolatæ acuminatæ 3–6 lin. longæ geminatæ. Perianthium 4–5 lin. longum segmentis ovato-lanceolatis subacutis 1–1½ lin. latis dorso anguste viridi-vittatis uninerviis. Filamenta 2 lin. longa subæqualia lanceolata. Stylus 1 lin. longus. *Chili,* Philippi, Bridges, 1317! etc. *Peruvia,* Matthews, 747! Maclean!

Var. *β.* CHLOROLEUCA, *Baker.*—Scilla chloroleuca, *Kunth, Enum.* iv. 325.—O. chloroleucum, *Lindl. Bot. Reg.* t. 1853. O. æquipetalum, *Bertero, MSS.*—O. gramineum, *Pöppig, MSS.* Racemus pauciflorus laxior pedicellis omnibus solitariis. *Chili,* Cuming, 890! Lechler, 2825! etc. O. bifolium, *Lodd. Bot. Cab.* t. 1802, non *C. Koch;* est forma hortensis depauperata. Inter *Scillam* et *Ornithogalum* ambigit: bracteæ geminatæ et perianthii segmenta uninervata prioris; stamina hypogyna posterioris.

37. O. NIVEUM, *Soland. in Ait. Hort. Kew.* i. 440; *Bot. Reg.* t. 235; *Schultes fil. Syst. Veg.* vii. 527; *Kunth, Enum.* iv. 358.—Urophyllon niveum, *Salisb. Gen.* 35.—O. setifolium, *Kunth, Enum.* iv. 351. Bulbus globosus 4–6 lin. crassus. Folia 5–6 filiformia firma glabra 3–6 poll. longa basi dilatata scapum amplectentia. Scapus gracillimus 2–4-pollicaris. Racemus sublaxe 4–10-florus expansus 1–1½ poll. longus. Pedicelli ascendentes, infimi 2–3 lin. longi. Bracteæ 1–2 lin. longæ ovatæ cuspidatæ. Perianthium inodorum 3–4 lin. longum segmentis ligulatis 1 lin. latis subobtusis albis dorso distincte viridi vittatis. Filamenta 2½–3 lin. longa, alterna latiora lanceolata. Stylus 1 lin. longus. *Cap. B. Spei,* Masson! Burchell, 3367! 4986! 6977!

38. O. COMPTUM, *Baker.* Bulbus globosus 9–12 lin. crassus. Folia 5–6 ascendentia coriacea subteretia 2–3 poll. longa haud ½ lin. lata facie profunde canaliculata margine incrassata obscure ciliata. Scapus 5–6-pollicaris. Racemus dense 12–20-florus expansus 1–1½ poll. longus, 8–9 lin. latus. Pedicelli ascendentes, infimi 1–1½ lin. longi. Bracteæ deltoideæ vel lanceolatæ longe cuspidatæ 1½–2 lin. longæ. Perianthium 3–3½ lin. longum segmentis albis obtusis ¾ lin. latis dorso viridi vittatis. Filamenta segmentis subduplo breviora linearia, alterna latiora. Stylus 1 lin. longus. *Cap. B. Spei,* Zeyher, 939! 942!

39. O. GRAMINIFOLIUM, *Thunb. Prodr.* 61; *Fl. Cap.* 313; *Kunth, Enum.* iv. 358.—O. Rudolphi, *Jacq. Eclog.* t. 20; *Kunth, Enum.* iv. 367.—O. tenuifolium, *Red. Lil.* t. 312, non *Gussone.*—O. rupestre, *Rudolphi in Schrad. Journ.* 1799, ii. 281, non *Linn.*—O. juncifolium, *Gawl. Bot. Mag.* t. 972, non *Jacq.*—O. Dregeanum, *Kunth, Enum.* iv. 351.—O. canaliculatum, *Lag. Gen.* 14; *Kunth, Enum.* iv. 370. Bulbus globosus 1–1½ poll. crassus. Folia 6–8 lineari-filiformia subteretia firma persistentia glabra 8–12 poll. longa facie canaliculata 1–1½ lin. lata basi dilatata. Scapus subpedalis. Racemus 6–30-florus expansus 2–4 poll. longus, 14–16 lin. latus. Pedicelli ascendentes, infimi 3–4 lin. longi. Bracteæ lanceolatæ cuspidatæ 2–3 lin. longæ. Perianthium 5–6 lin. longum segmentis 1½–2 lin. latis albis dorso distincte viridi vittatis. Filamenta segmentis duplo breviora leviter applanata, alterna latiora. Stylus 1½–2 lin. longus. *Cap. B. Spei,* Thunberg! Drege, 1508! Zeyher, 1681! etc. (*v. v. in hort. Kew.*).

40. O. JUNCIFOLIUM, *Jacq. Hort. Schœn.* t. 90; *Schultes fil. Syst.*

Veg. vii. 524; *Kunth, Enum.* iv. 358. Bulbus globosus $1\frac{1}{2}$–2 poll. crassus. Folia 12–20 subulata rigidula persistentia glabra 8–9 poll. longa. Scapus subpedalis, gracilis, flexuosus. Racemus 40–60-florus et ultra, ad pedem longitudinis attingens, 2 poll. latus. Pedicelli subpatentes, infimi 6–8 lin. longi. Bracteæ lanceolatæ cuspidatæ pedicellis duplo breviores. Perianthium inodorum 4–5 lin. longum segmentis ligulatis obtusis albis viridi-vittatis. Filamenta $2\frac{1}{2}$–3 lin. longa, alterna latiora. Stylus $1\frac{1}{2}$ lin. longus. *Cap. B. Spei.*

41. O. Bergii, *Schlecht. Linnæa,* 1826, 254; *Schult. fil. Syst.* vii. 507; *Kunth, Enum.* iv. 350. Bulbus globosus 4–6 lin. crassus. Folia 3–4 basin scapi amplectentia linearia dura persistentia pilosa 3–4 poll. longa, $1\frac{1}{2}$–2 lin. lata facie concava. Scapus flexuosus 6–9-pollicaris. Racemus dense 6–30-florus, expansus 2–3 poll. longus, 10–12 lin. latus. Pedicelli ascendentes, infimi 3–4 lin. longi. Bracteæ deltoideæ cuspidatæ 4–5 lin. longæ. Perianthium 4–$4\frac{1}{2}$ lin. longum, segmentis albidis oblanceolatis subacutis vix $1\frac{1}{2}$ lin. latis dorso distincte vittatis. Filamenta $1\frac{1}{2}$–2 lin. longa, alterna late dilatata interdum distincte bicuspidata. Stylus 1 lin. longus. *Cap. B. Spei,* Zeyher, 572! (sub nomine *O. ciliati*), 1682! Drege, 1506 *a*! Burchell, 6447!

42. O. pyrenaicum, *Linn. Sp. Plant.* 440 (ex parte); *Eng. Bot.* t. 44; *Jacq. Austr.* 103; *Red. Lil.* t. 234; *Kunth, Enum.* iv. 355; *Reich. Icones,* t. 1028.—Beryllis pyrenaica, *Salisb. Gen.* 33.—O. latifolium, *Linn. Herb.*! Bulbus ovoideus 9–12 lin. crassus. Folia 5–6 carnoso-herbacea ante finem florationis evanida, flaccida, lorata, glauco-viridia, facie canaliculata, 9–18 poll. longa, 2–4 lin. lata. Scapus strictus 1–2-pedalis. Racemus 30–50-florus vel ultra, expansus floriferus 4–6 poll. longus, 15–18 lin. latus. Pedicelli primum patentes fructiferi ascendentes, inferiores 6–9 lin. longi. Bracteæ lanceolatæ acuminatæ 3–4 lin. longæ. Perianthium 3–4 lin. longum segmentis oblanceolato-ligulatis subobtusis vix 1 lin. latis albidis dorso distincte viridi carinatis. Filamenta subæqualia lanceolata cuspidata $1\frac{1}{2}$–2 lin. longa. Stylus gracillimus $1\frac{1}{2}$ lin. longus. *Ab Anglia ad Hispaniam, Græciam, et Tauriam.*

Var. flavescens, *Baker.*—O. flavescens, *Lam. Ill.* t. 242. fig. 2.—Anthericum sulphureum, *Waldst. et Kit.* t. 95.—O. sulphureum, *Schultes fil. Syst. Veg.* vii. 518; *Kunth, Enum.* iv. 356; *Reich. Ic.* t. 1027.—O. pyrenaicum, *Linn. Herb.*! Perianthium flavescens viridi-vittatum. *A Gallia ad Tauriam et Phrygiam* (Balansa, 1324!).

43. O. virens, *Lindl. Bot. Reg.* t. 814; *Schult. fil. Syst.* vii. 507: *Kunth, Enum.* iv. 358. Bulbus ovoideus $1\frac{1}{2}$–2 poll. crassus. Folia 5–6 carnoso-herbacea lineari-lorata glabra $1\frac{1}{2}$–2 pedes longa, 9–12 lin. lata ad apicem acutum sensim attenuata. Scapus 1–$1\frac{1}{2}$-pedalis erectus teres. Racemus dense 30–50-florus, expansus 4–6 poll. lon-

gus, 15–18 lin. latus. Pedicelli ascendentes, infimi 2–3 lin. longi. Bracteæ lineari-subulatæ, infimæ 6–9 lin. longæ. Perianthium 3–4 lin. longum segmentis albis oblongis obtusis dorso distincte viridi vittatis. Filamenta 2 lin. longa alterna linearia alterna basi quadrato-dilatata obscure bicuspidata. Stylus 1 lin. longus. *Cap. B. Spei ad sinum Delagoa,* Forbes !

44. O. CAUDATUM, *Ait. Hort. Kew.* i. 442; *Jacq. Ic.* t. 423; *Bot. Mag.* t. 805; *Kunth, Enum.* iv. 357; *Ref. Bot.* t. 262.—O. Massoni, *Gmel. Syst.* i. 551. Bulbus ovoideus 3–4 poll. crassus. Folia 5–6 carnoso-herbacea lorato-lanceolata 1½–2 pedes longa glabra saturate viridia 15–18 lin. lata ad apicem acutum sensim attenuata. Scapus validus teres 1½–3-pedalis. Racemus 50–100-florus vel ultra, expansus 6–12 poll. longus, 2–2½ poll. latus. Pedicelli patentes, infimi 6–9 lin. longi. Bracteæ lineares, infimæ 8–12 lin. longæ. Perianthium odorum 5–6 lin. longum segmentis flavescenti-albidis 1½ lin. latis viridi-vittatis subobtusis. Filamenta 3–3½ lin. longa omnia basi deltoideo vel subquadrato-dilatata. Stylus 1–1½ lin. longus. *Cap. B. Spei, Hort. Kew.* 1776 ! *Hort. Saunders* (*v. v.* Cooper legit !).

45. O. SESSILIFLORUM, *Desf. Atlant.* i. 295; *Schultes fil. Syst.* vii. 530; *Kunth, Enum.* iv. 371. Bulbus globosus 9–18 lin. crassus. Folia 2–3-linearia carnoso-herbacea glabra 6–12 poll. longa, 2–3 lin. lata. Scapus 6–12-pollicaris. Racemi densi cylindrici 12–50-flori, expansi 1–4 poll. longi, 8–12 lin. crassi. Pedicelli infimi ½–1½ lin. longi diutine ascendentes. Bracteæ lineari-lanceolatæ 3–6 lin. longæ. Perianthium 3–4 lin. longum segmentis oblongis obtusis 1 lin. latis albis dorso distincte viridi-vittatis 3–4-nervatis. Filamenta linearia 1½–2 lin. longa, alterna latiora. Stylus 1 lin. longus. *Algeria,* Bourgeau ! Balansa, 220 ! etc.

46. O. ECKLONI, *Schlecht. Linnæa,* xxv. 177. Bulbus globosus 1–2 poll. crassus. Folia 5–6 carnoso-herbacea glabra linearia 1–1½ pedes longa, 4–6 lin. lata viridia ad apicem acutum sensim attenuata. Scapus 1½–2-pedalis. Racemus dense 20–50-florus expansus 3–6 poll. longus circiter 1 poll. latus. Pedicelli infimi 2–3 lin. longi. Bracteæ lineari-subulatæ 3–4 lin. longæ. Perianthium 2½–3 lin. longum segmentis oblongis obtusis 1 lin. latis albis dorso distincte viridi-vittatis. Filamenta 1½–2 lin. longa subæqualia lanceolata. Stylus 1 lin. longus. *Cap. B. Spei,* Burchell, 1777 ! *ad ripas fluminis Aapages,* Burke ! *Natal* Gerrard et M'Ken, 746 ! *Africa æquinoctialis orientalis,* Col. Grant !

Var. β. ACUMINATUM, *Baker.*—O. acuminatum, *Baker in Saund. Ref. Bot.* t. 177, non *Schur.* (O. canaliculatum *ad calcem tab. non Lagasca*). Robustior foliis latioribus pedicellis 5–6 lin. longis floriferis patentibus floribus majoribus. *Cap. B. Spei* (*v. v. in hort. Saund. et Kew.* Cooper legit).

47. O. SCILLOIDES, *Jacq. Hort. Schoen.* t. 88; *Schult. fil. Syst.* vii. 522; *Kunth, Enum.* iv. 358. Bulbus ovoideus sordide virescens 2–3

poll. crassus. Folia 5–6 carnoso-herbacea glabra lorata 1–2 pedes longa, 1–2 poll. lata deorsum concava extrorsum planiuscula ad apicem acutum sensim attenuata. Scapus validus 1½–2-pedalis. Racemus densus 1–1½ pedes longus, 50–100-florus vel ultra, expansus 15–18 lin. latus. Pedicelli ascendentes, infimi 5–6 lin. longi. Bracteæ lanceolato-setaceæ, infimæ 6–9 lin. longæ. Perianthium 5–6 lin. longum segmentis lanceolatis 1½ lin. latis dorso viridi vittatis. Filamenta linearia subæqualia 2½–3 lin. longa. Stylus 1½ lin. longus. *Cap. B. Spei.*

48. O. LONGEBRACTEATUM, *Jacq. Hort. Vind.* t. 29; *Red. Lil.* t. 120; *Schult. fil. Syst.* vii. 521; *Kunth, Enum.* iv. 357.—O. bracteatum, *Thunb. Prodr.* 62; *Fl. Cap.* 314. Bulbus ovoideus 3–4 poll. crassus. Folia 5–6 carnoso-herbacea glabra lanceolata viridia 1½–2 pedes longa, 9–18 lin. lata ad apicem acutum sensim attenuata. Scapus validus strictus 1½–2-pedalis. Racemus dense 30–60-florus vel ultra, expansus 6–9 poll. longus, 15–18 lin. latus. Pedicelli ascendentes, infimi 9–12 lin. longi. Bracteæ 9–12 lin. longæ setaceæ basi lineares ante florescentiam conspicuæ. Perianthium 4½–5 lin. longum segmentis oblongis obtusis albidis 1½ lin. latis dorso viridi-vittatis. Filamenta 2½–3 lin. longa alterna linearia et lanceolata. Stylus 1 lin. longus. *Cap. B. Spei,* Thunberg! Dr. Gill! etc.

49. O. NARBONENSE, *Linn. Sp. Plant.* 440; *Gouan, Ill.* 26; *Bot. Mag.* t. 2510; *Kunth, Enum.* iv. 355; *Gren. Fl. France,* iii. 188; *Parl. Fl. Ital.* ii. 447; *Reich. Icones,* t. 1029.—O. stachyoides, *Ait. Kew.* i. 441; *Kunth, Enum.* iv. 356; *Reich. Icones,* t. 1030.—Beryllis stachyoides, *Salisb. Gen.* 33.—O. lacteum, *Vill. Delph.* ii. 272, non *Jacq.* —O pyrenaicum, *Desf. Atl.* 293, non *Linn.* Bulbus ovoideus 9–15 lin. crassus. Folia 4–6 firmiora quam in pyrenaico et ante finem florationis haud evanida carnoso-herbacea anguste lorata 12–18 poll. longa, 3–6 lin. lata, glabra glauco-viridia facie canaliculata. Scapus 1–1½-pedalis strictus. Racemus sublaxe 20–50-florus, expansus 4–8 poll. longus, 1½–2 poll. latus. Pedicelli primum subpatentes, deinde ascendentes, inferiores 9–15 lin. longi. Bracteæ lanceolatæ cuspidatæ 6–9 lin. longæ. Perianthium 5–6 lin. longum segmentis oblanceolatis subobtusis 1–1½ lin. latis albidis distincte viridi-vittatis 4–6-nervatis. Filamenta 2 lin. longa basi lanceolata. Stylus filiformis 1½ lin. longus. *Ab insulis Fortunatis, Lusitania, et Gallia ad Algeriam, Græciam, et Caucasum.* O. trigynum, *Red. Lil.* t. 417; *Kunth, Enum.* iv. 357, est forma monstrosa hortensis carpellis discretis; O. brachystachys, *C. Koch, Linnæa,* xxii. 248, ex descriptione non potui segregare; O. densum, *Boiss. et Blanche, Diagn.* ii. 4, 107, est forma orientalis gracilis densiflora; O. pyramidalis, *Linn. Sp. Plant.* 441, *Red. Lil.* t. 422, *Jacq. Ic.* t. 425, *Kunth, Enum.* iv. 355, est forma robusta grandiflora hortensis.

Var. β. FUSCESCENS, *Baker.*—O. fuscescens, *Boiss. et Gaill. Diagn.* ii. 4,

107. Perianthium fuscescens, filamentis segmentis quadruplo brevioribus. Bracteæ utrinque lacinia setacea auctæ. *Antilibanus,* Gaillardot.

50. O. CRENULATUM, *Linn. Suppl.* 198; *Thunb. Prodr.* 62; *Fl. Cap.* 315; *Kunth, Enum.* iv. 371. Bulbus ovoideus 5–6 lin. crassus. Folia 2 oblonga obtusa vel subacuta crassa carnoso-herbacea 12–15 lin. longa, 4–5 lin. lata marginibus prominulis papillosis glabris. Scapus 2–4-pollicaris. Racemus 4–8-florus, 1–2 poll. longus, 5–6 lin. latus. Pedicelli diutine ascendentes, infimi 3–4 lin. longi. Bracteæ lanceolatæ acuminatæ 3–4 lin. longæ. Perianthium 3–3½ lin. longum, segmentis ovato-lanceolatis 1½ lin. latis albis distincte viridi-vittatis. Filamenta subæqualia lanceolata 2 lin. longa. Stylus 1 lin. longus. *Cap. B. Spei,* Thunberg.

51. O. OVATUM, *Thunb. Prodr.* 62; *Fl. Cap.* 315; *Kunth, Enum.* iv. 359. Folia "2" rigide coriacea oblonga 1½–2 poll. longa, 4–6 lin. lata subobtusa cuspidata marginibus incrassatis scariosis glabris. Scapus pollicaris. Racemi dense 6–20-flori, 9–15 lin. longi, 10–12 lin. lati. Pedicelli infimi 1½–2 lin. longi. Bracteæ lanceolatæ acuminatæ 2–3 lin. longæ. Perianthium 3 lin. longum, segmentis ligulatis obtusis 1 lin. latis albis distincte viridi-vittatis. Filamenta lanceolata subæqualia 2–2½ lin. longa. Stylus 1 lin. longus. *Cap. B. Spei* (vidi exempla originalia in *Herb. Thunb.*, sed an folia ad scapum recte pertineant dubito).

Subgenus V. OSMYNE (*Salisb. extens.*).

Racemi 6–40-flori, expansi ovoideo-deltoidei vel lanceolati. *Perianthii* segmenta flava dorso distincte viridi carinata 2–4-nervata, flore expanso rotata vel leviter recurvata. *Filamenta* segmentis duplo breviora vel interdum longiora. *Stylus* elongatus filiformis ovario æquilongus vel interdum duplo longior.—Osmyne et Tæniola, *Salisb.*—Ornithogalum, § Albucoides, *Kunth, ex parte.*

52. O. VITTATUM, *Kunth, Enum.* iv. 368.—Albuca vittata, *Gawl. Bot. Mag.* t. 1329; *Schultes fil. Syst.* vii. 500.—Tæniola vittata, *Salisb. Gen.* 35. Bulbus ovoideus 1 poll. crassus. Folia 5–6 subteretia carnoso-herbacea 6–8 poll. longa 1–1½ lin. lata glabra facie canaliculata, glaucescenti-viridia. Scapus strictus 6–9-pollicaris. Racemus laxe 6–12-florus expansus, 3–4 poll. longus, 1½ poll. latus. Pedicelli inferiores 6–9 lin. longi subpatentes, leviter cernui. Perianthium 5–6 lin. longum inodorum segmentis oblanceolatis 1–1½ lin. latis leviter reflexis luteis dorso distincte anguste viridi-carinatis 4–5-nervatis. Filamenta 2½–3 lin. longa basi lanceolata, alterna latiora bicuspidata. Stylus filiformis 3–3½ lin. longus gracillimus. *Cap. B. Spei.*

53. O. BARBATUM, *Jacq. Hort. Schoen.* t. 91; *Kunth, Enum.* iv. 366. Bulbus ovoideo-subglobosus 1 poll. crassus. Folia 1–2 carnoso-her-

bacea subulata glabra 6–9 poll. longa facie canaliculata. Scapus subpedalis folio crassior teres erectus. Racemus laxe 5–6-florus expansus 2½–3 poll. longus. Pedicelli erecto-patentes, infimi 5-6 lin. longi. Bracteæ lineares purpurascentes 3–4 lin. longæ. Perianthium 5–6 lin. longum segmentis oblongis obtusis 1½–2 lin. latis luteis viridi-carinatis omnibus apice leviter cucullatis interioribus pubescentibus. Filamenta subæqualia, segmentis subduplo breviora, basi complanata. Stylus filiformis 2–3 lin. longus. *Cap. B. Spei.*

54. O. TUBEROSUM, *Mill. Dict.* no. 10; *Kunth, Enum.* iv. 372.—O. polyphyllum, *Jacq. Ic.* t. 430; *Kunth, Enum.* iv. 366.—O. consanguineum, *Kunth, Enum.* iv. 368. Bulbus ovoideus 12–15 lin. crassus fuscescens. Folia plura, 8–12, lineari-subulata, carnoso-herbacea, 6–8 poll. longa, 1–1½ lin. lata, facie canaliculata, basi dilatata. Scapus 6–18-pollicaris. Racemus laxe 6–12-florus, expansus 3–4 poll. longus, 2½–3 poll. latus. Pedicelli subpatentes, infimi 12–15 lin. longi. Bracteæ lanceolatæ acuminatæ pedicellis subæquilongæ. Perianthium odorum 9–10 lin. longum segmentis oblongis obtusis 1½–2 lin. latis luteis dorso distincte late viridi-carinatis 4–5-nervatis. Filamenta subæqualia 3–4 lin. longa basi applanata. Stylus rectus 3 lin. longus. *Cap. B. Spei,* Ecklon! Zeyher! Mund et Maire.

55. O. BOLUSIANUM, *Baker.* Bulbus depresso-globosus 1 poll. crassus. Folia 3–4 superposita basi subpetiolata basin scapi amplectentia lamina horizontaliter patente lanceolata 15–18 poll. longa, 4–5 lin. lata acuta margine ciliata. Scapus gracilis semipedalis. Racemus laxe 6–10-florus, expansus 3-4 poll. longus. Pedicelli ascendentes 1½–3 lin. longi. Bracteæ parvæ deltoideæ acuminatæ. Perianthium 4½–5 lin. longum segmentis lanceolatis subacutis flavicanti-viridibus flore expanso reflexis indistincte carinatis. Filamenta lanceolata, segmentis duplo breviora, alterna latiora. Stylus filiformis ovario brevior. *Cap. B. Spei,* Bolus, 96! Vidi tab. ex exemplo in hort. Kew. anno 1823 cultum ab Bowie missum.

56. O. KIRKII, *Baker.*—Folia plura carnoso-herbacea glabra linearia basin scapi amplectentia ad pedem et ultra longa 3–4 lin. lata. Scapus gracilis semipedalis. Racemus laxissime 6–10-florus expansus 5–6 poll. longus, pedicellis ascendentibus infimis 1½-2 poll. longis superioribus sensim brevioribus. Bracteæ lanceolatæ scariosæ 3–4 lin. longæ. Perianthium 5–6 lin. longum segmentis 1½ lin. latis omnibus apice cucullatis luteis dorso late distincte viridi-carinatis. Filamenta 3–4 lin. longa subæqualia linearia. Stylus cylindricus 2–2½ lin. longus. *Africa tropicalis austro-orientalis in ditione fluminis Zambesi ad Shupanga,* Dr. Kirk!

57. O. SUAVEOLENS, *Jacq. Ic.* t. 431; *Willd. Sp.* ii. 122; *Schult. fil. Syst. Veg.* vii. 523; *Kunth, Enum.* iv. 366.—O. albucoides, *Thun. Fl.*

Cap. edit. Schult. 314; *Kunth, Enum.* iv. 367.—Anthericum albucoides, *Ait. Hort. Kew.* i. 449.—Phalangium albucoides, *Poir. Ency.* v. 249. Bulbus globosus 1–1½ poll. crassus. Folia 5–6 carnoso-herbacea linearia 6–9 poll. longa, 2–2½ lin. lata acuta basin scapi amplectentia. Scapus pedalis et ultra strictus teres modice validus. Racemus laxe 6–12-florus, expansus 4–6 poll. longus. Pedicelli ascendentes, inferiores 1½–2½ poll. longi. Bracteæ lanceolatæ 8–12 lin. longæ scariosæ persistentes. Perianthium 6–8 lin. longum suaveolens segmentis oblanceolatis obtusis 1½ lin. latis luteis dorso late carinatis distincte 4–5-nervatis. Filamenta 3 lin. longa subæqualia basi leviter applanata. Stylus filiformis 2½–3 lin. longus leviter declinatus. *Cap. B. Spei,* Thunberg! Hort. Kew. anno 1788! Drege, 1511! (Exemplum originale Aitonianum in herb. Banks. et Thunbergianum in herb. suo vidi.)

Var. *β,* ODORATUM, *Baker.*—O. odoratum, *Jacq. Icones,* t. 432; *Andr. Bot. Rep.* t. 260; *Kunth, Enum.* iv. 366.—Osmyne odorata, *Salisb. Gen.* 35. Robustior foliis latioribus, racemo interdum pedali, bulbo 2 poll. crasso. *Cap. B. Spei.* Vix ultra formam robustam hortensem.

58. O. PRASINUM, *Lindl. Bot. Reg.* t. 158; *Kunth, Enum.* iv. 360. Bulbus ovoideus 1½–2 poll. crassus. Folia 6–8 carnoso-herbacea linearia pedalia glaucescenti-viridia 4–5 lin. lata ad apicem sensim angustata, facie canaliculata. Scapus pedalis et ultra. Racemus dense 20–40-florus, expansus 3–5 poll. longus, 3–4 poll. latus. Pedicelli subpatentes stricti, infimi 2 poll. longi. Bracteæ lineari-subulatæ, infimæ 6–9 lin. longæ. Perianthium inodorum 6–7 lin. longum segmentis oblongis obtusis 1½–2 lin. latis luteis dorso late viridi-vittatis distincte 4–5-nervatis. Filamenta 3–4 lin. longa subæqualia basi lanceolata. Stylus gracilis filiformis 3 lin. longus. *Cap. B. Spei,* Burchell, 1966! *Ad ripas fluminis Aapages,* Burke!

59. O. MELLERI, *Baker.* Bulbus ovoideus 1½ poll. crassus. Folia 4–5 lineari-lorata carnoso-herbacea basin scapi amplectentia sesquipedalia glabra 5–6 lin. lata ad apicem sensim angustata. Scapus 1½–2-pedalis strictus modice validus. Racemus laxe 6–15-florus, expansus 6–9 poll. longus, 15–18 lin. latus. Pedicelli subpatentes vel ascendentes floriferi distincte cernui, infimi 4–6 lin. longi. Bracteæ lineares membranaceæ 3–4 lin. longæ. Perianthium 8–9 lin. longum segmentis oblongo-oblanceolatis 2–2½ lin. latis obtusis luteis dorso late viridi-carinatis distincte 5–6-nervatis. Filamenta 5–6 lin. longa subæqualia basi deltoidea valvata. Stylus filiformis 5–6 lin. longus. *Africa tropicalis austro-orientalis ad montes Manganja,* Dr. Meller. In Hort. Kew. anno 1862 cult!

60. O. MACRANTHUM, *Baker.* Folia carnoso-herbacea lorata glabra flaccida 1½–2 pedes longa, 4–6 lin. lata. Scapus * * *. Race-

mus laxe 20–25-florus, expansus ad pedem et ultra longus 3½–4 poll. latus. Bracteæ lineares 3–4 lin. longæ ante anthesin evanescentes. Pedicelli 1½–2 poll. longi ascendentes apice cernui turbinatim incrassati. Perianthium 15–16 lin. longum segmentis teneris ad basin tertii superioris 2½ lin. latis flavescentibus dorso anguste viridi-carinatis distincte 2–3-nervatis. Filamenta 8–9 lin. longa ex apice anguste petaloideo-complanata. Stylus rectus gracillimus 6–7 lin. longus. *Cap. B. Spei*, Drege, 2204! 3531!

Subgenus VI. CATHISSA (*Salisb.* extens.).

Racemi 3–100-flori expansi lanceolati vel subcylindrici. *Perianthii* segmenta albida concoloria venis flabellatis inconspicuis, dorso haud viridi-carinatis, flore expanso patentia vel leviter recurvata. *Filamenta* hypogyna segmentis subduplo breviora. *Stylus* ovario æquilongus vel brevior.—Cathissa et Eustachys, ex parte, *Salisb.*

61. O. GRISEUM, *Baker.* Bulbus fuscescens 1½–2 poll. crassus. Folia 5–6 lineari-subulata glabra ascendentia 6–8 poll. longa haud 1 lin. lata. Scapus gracilis subpedalis. Racemus circiter 20-florus, expansus 3–4 poll. longus. Pedicelli erecto-patentes 2–3 lin. longi. Bracteæ lineares 1½–2 lin. longæ. Perianthium 3 lin. longum segmentis subconcoloribus albido-griseis 1 lin. latis obtusis alternis apice leviter cucullatis. Filamenta subæqualia 1 lin. longa basi leviter applanata. Stylus ovario æquilongus. *Cap. B. Spei* (e tab. ex exemplo in Hort. Kew. anno 1823 cult. a Bowie misso).

62. O. ZEYHERI, *Baker.* Bulbus ovoideus 5–6 lin. crassus. Folia 5–6 carnoso-herbacea lineari-subulata glabra 6–12 poll. longa, ½–1 lin. lata. Scapus 3–12-pollicaris. Racemus laxe 12–30-florus expansus, 3–6 poll. longus, 15–18 lin. latus. Pedicelli ascendentes, infimi 9–12 lin. longi. Bracteæ lineares membranaceæ 3–4 lin. longæ. Perianthium 2½–3 lin. longum segmentis albidis subconcoloribus oblanceolatis subacutis haud 1 lin. latis. Filamenta subæqualia 1½ lin. longa basi linearia. Stylus ovario turbinato brevior haud 1 lin. longus. *Cap. B. Spei*, Drege, 878 *b*! Cooper, 601! Zeyher, 1686!

63. O. DELTOIDEUM, *Baker.* Folia 4–5 basin scapi longe involventia superposita parte libera subulata coriacea persistentia 1 poll. longa facie canaliculata prorsus setis flavidis conspicuis vestita. Scapus gracilis 3–4-pollicaris. Racemus laxe 3–6-florus. Pedicelli graciles ascendentes, infimi 3–4 lin. longi. Bracteæ membranaceæ late cordato-deltoideæ cuspidatæ 1 lin. longæ. Perianthium 4–4½ lin. longum segmentis lanceolatis albidis concoloribus acutis 1½ lin. latis. Filamenta 3 lin. longa lanceolata subæqualia. Stylus ovario æquilongus. *Cap. B. Spei*, Drege, 2664!

64. O. PUBESCENS, *Baker*. Bulbus ovoideus 3–4 lin. crassus. Folia 2–3 basin scapi longe involventia superposita, lamina horizontaliter patentia lanceolata membranacea 6–12 lin. longa, 2 lin. lata undique pilis setosis conspicuis vestita. Scapus gracilis 4–5-pollicaris flexuosus. Racemus laxe 5–6-florus primum nutans, expansus 1 poll. longus. Pedicelli ascendentes, infimi 2–3 lin. longi. Bracteæ lineari-subulatæ 1½–2 lin. longæ. Perianthium campanulatum 1½–2 lin. longum segmentis lanceolatis acutis concoloribus. Filamenta 1 lin. longa filiformia subæqualia. Stylus 1 lin. longus. *Cap. B. Spei* (*Albany*), Williamson in herb. Trin. Coll. Dub.!

65. O. PILOSUM, *Linn. Suppl.* 199; *Thunb. Prodr.* 61; *Fl. Cap.* 315; *Kunth, Enum.* iv. 370.—O. Mundianum, *Kunth, Enum.* iv. 351. Bulbus ovoideus 6–9 lin. crassus castaneo-tunicatus. Folia 3–4 basin scapi amplectentia rigide coriacea linearia 4–6 poll. longa, 1½–2 lin. lata, distincte nervata, persistentia, marginibus distincte ciliatis. Scapus gracilis flexuosus 6–12-pollicaris. Racemus sublaxe 6–20-florus, expansus 2–3 poll. longus, 1–1½ poll. latus. Pedicelli ascendentes sæpe arcuati, infimi 6–12 lin. vel ultra longi. Bracteæ persistentes lanceolatæ cuspidatæ, infimæ 4–6 lin. longæ. Perianthium 4–5 lin. longum segmentis lanceolatis acutis albidis concoloribus 1 lin. latis. Filamenta subæqualia lanceolata 2½–3 lin. longa. Stylus 1½ lin. longus ovario æquilongus. *Cap. B. Spei*, Masson! Thunberg! Burchell, 6802! Cooper, 1670! 1695! etc.

66. O. HISPIDUM, *Hornem. Hort. Hafn.* 331; *Kunth, Enum.* iv. 350. —Anthericum pilosum, *Jacq. Ic.* t. 416; *Willd. Sp. Plant.* ii. 140.—Phalangium pilosum, *Poir. Ency.* v. 244. Bulbus depresso-globosus albidus 9–12 lin. crassus. Folia 3–4 basin scapi longe involventia superposita linearia plana flaccida carnoso-herbacea patentia 5–6 poll. longa, 5–6 lin. lata ad oras pilosa. Scapus gracilis 8–10-pollicaris. Racemus laxe 8–9-florus, expansus 3–4 poll. longus, 2 poll. latus. Pedicelli ascendentes, infimi 9–12 lin. longi. Bracteæ lanceolatæ 4–6 lin. longæ. Perianthium 8–9 lin. longum inodorum segmentis albidis subconcoloribus lanceolatis acutis flore expanso stellatis. Filamenta æqualia subulata segmentis subduplo breviora. Stylus filiformis ovario æquilongus. *Cap. B. Spei.*

67. O. UNIFOLIUM, *Gawl. Bot. Mag.* t. 935; *Schultes fil. Syst.* vii. 529; *Kunth, Enum.* iv. 359.—Scilla unifolia, *Linn. Sp. Plant.* 443. —Cathissa uniflora, *Salisb. Gen.* 34.—O. nanum, *Brot. Fl. Lusit.* 529! *Phyt. Lus.* t. 46. fig. 1, non *Smith.* Bulbus ovoideus subfuscus 4–6 lin. crassus. Folium solitarium, basin scapi longe involvens, lineare, facie canaliculatum, glabrum, carnoso-herbaceum, 3–6 poll. longum, 1½–2 lin. latum. Scapus 3–6-pollicaris. Racemus subspicatus 3–6-florus. Bracteæ lanceolatæ cuspidatæ 4–6 lin. longæ.

Perianthium 5–6 lin. longum, segmentis oblongis obtusis $1\frac{1}{2}$–2 lin. latis albidis concoloribus. Filamenta æqualia filiformia 3 lin. longa. Stylus gracilis 2 lin. longus. *Hispania, Lusitania, Mauritania.*

Var. β, CONCINNUM, *Gawl. Bot. Mag.* t. 953.—O. concinnum, *Salisb. Prodr.* 240.—Cathissa concinna, *Salisb. Gen.* 34.—O. roccense, *Link in Schrad. Journ.* 1799, iv. 320.—Robustior elatior, foliis 2 raro 3–5 interdum subpedalibus, racemo 8–20-floro. *Hispania,* Bourgeau, 2543! *Lusitania,* Welwitsch!

68. O. TENELLUM, *Jacq. Ic.* t. 427; *Schultes fil. Syst.* vii. 526; *Kunth, Enum.* iv. 358. Bulbus globosus brunneus 6–9 lin. crassus. Folia 4–5 carnoso-herbacea glabra linearia 8–10 poll. longa, $1\frac{1}{2}$–2 lin. lata facie canaliculata. Scapus gracilis subpedalis viridi-fuscus. Racemus sublaxe 6–12-florus, expansus lanceolatus 3–4 poll. longus. Pedicelli ascendentes, inferiores 6–8 lin. longi. Bracteæ lanceolatæ acuminatæ pedicellis subæquilongæ. Perianthium 6–8 lin. longum inodorum segmentis lanceolatis acutis $1\frac{1}{2}$–2 lin. latis lacteis dorso obscure virentibus. Filamenta $2\frac{1}{2}$–3 lin. longa subæqualia deorsum leviter applanata. Stylus $1\frac{1}{2}$ lin. longus ovario lanceolato duplo brevior. *Cap. B. Spei,* Burchell, 7216!

69. O. LATIFOLIUM, *Linn. Sp. Plant.* 440; *Mill. Dict.* no. 3; *Jacq. Icones,* t. 424; *Gawl. Bot. Mag.* t. 876; *Bot. Reg.* t. 1978; *Kunth, Enum.* iv. 354.—Eustachys latifolia, *Salisb. Gen.* 33.—O. arcuatum, *Stev. Act. Mosq.* vii. 75; *Kunth, Enum.* iv. 355; *Led. Flor. Ross.* iv. 158. Bulbus globosus $1\frac{1}{2}$–2 poll. crassus. Folia 5–6 carnoso-herbacea lorata glabra flaccida viridia 12–15 poll. longa, 6–12 lin. vel in planta culta $1\frac{1}{2}$–2 poll. lata. Scapus validus erectus 1–2-pedalis. Racemus 50–100-florus vel ultra, expansus 12–18 poll. longus, 3–4 poll. latus. Pedicelli $1\frac{1}{2}$–2 poll. longi diutine arcuato-ascendentes. Bracteæ lanceolatæ acuminatæ 6–9 lin. longæ. Perianthium 5–6 lin. longum segmentis lacteis concoloribus oblongo-oblanceolatis subobtusis $1\frac{1}{2}$–2 lin. latis. Filamenta $1\frac{1}{2}$–2 lin. longa subæqualia lanceolata acuminata. Stylus 1 lin. longus. *Tauria,* Steven! *Caucasus,* Hohenacker! *Kurdistan,* Brant!

70. O. LACTEUM, *Jacq. Ic.* t. 434; *Andr. Bot. Rep.* t. 274; *Bot. Mag.* t. 1134; *Red. Lil.* t. 418; *Lodd. Bot. Cab.* t. 1159; *Kunth, Enum.* iv. 354, non *Villars.*—Aspasia lactea, *Salisb. Gen.* 34. Bulbus subglobosus albidus 1–$1\frac{1}{2}$ poll. crassus. Folia 9–10 carnoso-herbacea ascendentia rosulata basin scapi amplectentia lorata 8–12 poll. longa, $\frac{1}{2}$–1 poll. lata margine subtiliter ciliata. Scapus validus erectus 1–2-pedalis. Racemus dense 20–50-florus vel ultra expansus semipedalis vel ultra longus 2–$2\frac{1}{2}$ poll. latus. Pedicelli erecto-patentes, infimi 9–12 lin. longi. Bracteæ lanceolatæ 6–9 lin. longæ. Perianthium 7–9 lin. longum, inodorum, segmentis oblongis subobtusis 3–4 lin. latis

lacteis concoloribus, ima basi virescentibus. Filamenta 2½–3 lin. longa subæqualia vix applanata. Stylus 1½ lin. longus. *Cap. B. Spei*, Ecklon, 569! Whitehead.

Var. *β*, CONICUM, *Baker.*—O. conicum, *Jacq. Ic.* t. 428; *Bot. Mag.* t. 3538; *Kunth, Enum.* iv. 354. Gracilior, foliis bracteis et perianthii segmentis angustioribus, racemo laxiore. *Cap. B. Spei.*

Subgenus VII. LEDEBOURIOPSIS, *Baker.*

Species anomalæ ab omnibus reliquis recedentes filamentis distincte perigynis perianthii segmentis flore expanso supra basin falcatis. *Stirps* inter *Ornithogalum*, *Scillam* et *Urgineam* ambigua.

71. O.? ANOMALUM, *Baker in Saund. Ref. Bot.* t. 178. Bulbus globosus viridis 2 poll. crassus. Folia sæpissime solitaria, raro geminata, perfecte teretia 1½–2 pedes longa, 2–2½ lin. crassa carnoso-herbacea flaccida glaucescentia ad apicem sensim attenuata. Scapus gracilis teres pallide glauco-viridis sesquipedalis. Racemus sublaxe 30–40-florus, expansus 6–9 poll. longus vix 1 poll. latus. Bracteæ minutissimæ deltoideæ. Pedicelli erecto-patentes stricti apice articulati, infimi 2–3 lin. longi. Perianthium 3 lin. longum segmentis basi connatis lanceolatis obtusis luteis dorso viridi-vittatis flore expanso supra basin falcatis. Filamenta perigyna subæqualia vix applanata segmentis duplo breviora. Stylus ovario æquilongus. *Cap. B. Spei* (*v. v. in hort. Saund.* Cooper legit!), MacOwan, 1853!

72. O.? COOPERI, *Baker.* Folia 2-linearia planiuscula glabra crasse carnoso-coriacea acuta basin scapi amplectentia 7–8 poll. longa, 3–4 lin. lata marginibus leviter incrassata. Scapus 1–1½-pedalis. Racemus laxe 40–100-florus expansus ad pedem longitudinis attingens vix 1 poll. latus. Pedicelli ascendentes vel cernui 3–4 lin. longi. Bracteæ lanceolatæ vel deltoideæ albidæ membranaceæ 1–1½ lin. longæ. Perianthium campanulatum 3 lin. longum segmentis lanceolatis subobtusis luteis dorso viridi-vittatis uninervatis flore expanso supra basin falcatis. Filamenta perigyna subæqualia basi linearia. Stylus 1½ lin. longus ovario æquilongus. *Cap. B. Spei*, Cooper cult. hort. Kew. anno 1864! *ad oram orientalem*, Mrs. Barber in herb. T. C. D.!

73. O.? CAPITATUM, *Hook. fil. Bot. Mag.* t. 5388. Bulbus globosus 1½–2 poll. crassus. Folia post anthesin matura plura carnoso-herbacea lineari-lorata demum ad pedem longitudinis attingentia 4–6 lin. lata. Scapi 1–2 validi erecti teretes 6–9-pollicares. Racemi dense 20–30-flori capitati globosi 15–18 lin. lati. Pedicelli 3–6 lin. longi. Bracteæ minutæ saccatæ ovato-deltoideæ membranaceæ albidæ. Perianthium 2–2½ lin. longum segmentis marcescentibus lanceolatis sub-

obtusis facie albidis dorso uninervatis purpureo-vittatis flore expanso supra basin falcatis. Filamenta clavato-filiformia subæqualia segmentis subduplo breviora. Stylus ovario æquilongus. *Kaffraria britannica*, Cooper, 208!

34. ALBUCA, *Linn.*

Linn. Gen. no. 416; *Dryand. Act. Holm.* 1784, 296; *Endlich. Gen.* 1133; *Kunth, Enum.* iv. 372; *Harvey, Cap. Gen.* 2nd edit. 397; *Salisb. Gen.* 36.—Falconera, Pallastema, et Branciona, *Salisb. Gen.* 36.

Perianthium basi 6-partitum segmentis 3 exterioribus oblongis obtusis apice cucullatis patulis late viridi-vittatis multinervatis, 3 interioribus paulo brevioribus latioribus diutine calyptratim conniventibus apice tuberculo flavo glanduloso cristatis. *Stamina* 6 hypogyna segmentis interioribus æquilonga *antheris* oblongis versatilibus alternis (segmentis exterioribus oppositis) abortivis vel minoribus. *Ovarium* sessile oblongum ovulis in loculo numerosis; *stylus* ovario subæquilongus triquetro-clavatus inverse pyramidalis vel in § *Pallastema* filiformis ovario 2–3-plo longior; *stigmata* 3 sæpissime deltoidea papillosa. *Capsula* magna chartacea loculicide trivalvis, seminibus in loculo pluribus (sæpe ultra 20) oblongis confertis. *Testa* membranacea nigra. *Herbæ bulbosæ foliis synanthiis carnoso-herbaceis loratis vel lineari-filiformibus, floribus albo-viridibus vel flavo-viridibus speciosis.*

§ EUALBUCA. *Stamina exteriora castrata. Stylus brevis obconicus.*
Albiflora foliis loratis .... 1. *altissima.*
Flavifloræ foliis glabris.
Bulbus squamis truncatis coronatus.
Folia lorata 9–12 lin. lata .... 2. *major.*
Folia linearia 4–6 lin. lata .... 3. *minor.*
Bulbus fibris solutis coronatus .... 4. *flaccida.*
Viridiflora foliis glanduloso-villosis .... 5. *viridiflora.*

§§ FALCONERA (Salisb. extens.). *Stamina omnia fertilia. Stylus brevis obconicus.*
Racemus deltoideus floribus diutine erectis.
Albifloræ.
Folia lorata 6–12 lin. lata .... 6. *fastigiata.*
Folia linearia 4–6 lin. lata................ 7. *caudata.*

Flavifloræ.
Folia lorata planiuscula.
Bulbus squamis integris coronatus ...... 8. *aurea.*
Bulbus setis fibrosis coronatus .... 9. *setosa.*
Folia filiformia .... 10. *tenuifolia.*
Racemus lanceolatus floribus primum cernuis.
Albiflora foliis lineari-subulatis viscosis ...... 11. *viscosa.*
Flavifloræ.
Folia linearia glabra .... 12 *fragrans.*
Folia subteretia glandulosa .... 13. *spiralis.*

§§§ Pallastema (Salisb.). *Stamina omnia fertilia. Stylus filiformis elongatus.*

Perianthii segmenta 2-2½ lin. lata.
Perianthium 8–9 lin. longum .... 14. *abyssinica.*
Perianthium 10–14 lin. longum .... 15. *angolensis.*
Perianthii segmenta 4–4½ lin. lata .... 16. *Bainesii.*

1. A. altissima, *Dryand. Act. Holm.* 1784, 292; *Jacq. Ic.* t. 63; *Kunth, Enum.* iv. 373.—A. alba, *Lam. Encyc.* i. 76.—A. cornuta, *Red. Lil.* t. 70; *Kunth, Enum.* iv. 373. Bulbus depresso-globosus 2 poll. vel ultra crassus. Folia 6–9 lorata planiuscula glauca carnoso-herbacea glabra 1½–2 pedes longa medio 1–2 poll. lata. Scapus teres validus glaucus 1½-2-pedalis. Racemus laxe 12–30-florus expansus 12–18 poll. longus, 3–4 poll. latus. Pedicelli infimi 2–2½ poll. longi, floriferi apice cernui. Bracteæ lanceolatæ 9-12 lin. longæ. Perianthium inodorum 9–12 lin. longum segmentis exterioribus oblongo-lanceolatis 2½-3 lin. latis albis late viridi-vittatis. Filamenta alterna sterilia, fertilia 5–6 lin. longa. Stylus 3–4 lin. longus. Capsula 8 9 lin. longa seminibus in loculo 20–30. *Cap. B. Spei,* Hort. Lee, 1782! Hort. Jacquin! Burchell, 6197! Hort. Luxembourg, 1820! etc.

2. A. major, *Linn. Sp. Plant.* 438; *Jacq. Ic.* t. 443; *Bot. Mag.* t. 804; *Red. Lil.* t. 69; *Bot. Cab.* t. 1191; *Kunth, Enum.* iv. 374. Bulbus globosus 1½–2 poll. crassus proliferus. Folia 6–10 lorata planiuscula 1–1½-pedalia, 9–12 lin. lata glabra carnoso-herbacea. Scapus teres validus 1–2-pedalis. Racemus laxe 6–15-florus, expansus 6–15 poll. longus, 3–4 poll. latus. Pedicelli infimi 2–3 poll. longi, primum apice cernui demum ascendentes. Bracteæ lanceolatæ 1–1¼ poll. longæ. Perianthium inodorum 9–12 lin. longum segmentis exterioribus oblongo-lanceolatis 2½–3 lin. latis flavis late viridi-carinatis. Filamenta alba filiformia, alterna sterilia. Stylus 3–4 lin. longus. Capsula 9–10 lin. longa seminibus in loculo 20–30. *Cap. B. Spei,*

(*Herb. Ait. ex hort. Kew.* 1779!), Zeyher, 4190! Harvey, 887! Alexander! etc.

3. A. MINOR, *Linn. Sp. Plant.* 438; *Bot. Mag.* t. 720; *Red. Lil.* t. 21; *Kunth, Enum.* iv. 374; *Ref. Bot.* t. 239. Bulbus ovoideus 12–15 lin. crassus proliferus squamis paucis latis coronata. Folia 5–6 linearia viridia glabra carnoso-herbacea 6–12 poll. longa medio 4–6 lin. lata facie deorsum concava. Scapus firmus teres 12–18-pollicaris. Racemus laxe 6–12-florus, expansus 6–9 poll. longus, 3–4 poll. latus. Pedicelli subpatentes apice cernui, inferiores 15–18 lin. longi. Bracteæ lanceolatæ 4–6 lin. longæ. Perianthium inodorum 9–12 lin. longum segmentis exterioribus oblongo-lanceolatis 2½–3 lin. latis flavis late viridi-carinatis, interioribus paulo brevioribus, glandula reniformi papillosa apice instructis. Filamenta alba filiformia, alterna sterilia. Stylus ovario æquilongus. Capsula ovoidea 8–9 lin. longa seminibus in loculo 20. *Cap. B. Spei* (*Herb. Aiton. ex hort. Kew.* 1784!) Ecklon et Zeyher, 98! Wright, 222! Macgillivray, 477! (*v. v. in hort. Kew.*). Ab *A. minore, A. coarctata,* Dry. Act. Holm. 1784, p. 293, Kunth, Enum. iv. 375, ex descriptione, solum differt bracteis pedicellis ultrauncialibus paulo brevioribus. Non vidi.

4. A. FLACCIDA, *Jacq. Ic.* t. 444; *Kunth, Enum.* iv. 374; *Ref. Bot.* t. 334. Bulbus globosus 6–9 lin. crassus fibris pluribus setosis coronata. Folia 5–6-linearia pallide viridia glabra carnoso-herbacea facie canaliculata flaccido-decurvata, 6–12 poll. longa, 3–6 lin. lata. Scapus glaber flexuosus 6–12 poll. longus. Racemus laxe 6–8-florus, expansus 6–8 poll. longus subsecundus. Pedicelli 12–18 lin. longi, floriferi patentes apice cernui, fructiferi ascendentes. Bracteæ lanceolatæ, infimæ 6–9 lin. longæ. Perianthium inodorum 9–10 lin. longum segmentis exterioribus flavis late viridi-carinatis. Filamenta alterna sterilia. Stylus ovario æquilongus. Capsula ovoidea 7–8 lin. longa, seminibus in loculo 20 vel ultra. *Cap. B. Spei,* Zeyher, 1714! Harvey, 812! Cooper! *ad sinum Delagoa,* Forbes!

5. A. VIRIDIFLORA, *Jacq. Ic.* t. 446; *Bot. Mag.* t. 1656; *Kunth, Enum.* iv. 374. Bulbus globosus 1–1½ poll. crassus. Folia 6–9-linearia subteretia erectiuscula subpedalia 2–3 lin. lata dense persistenter villoso-glandulosa. Scapus subpedalis deorsum villosa. Racemus laxe 6–10-florus. Pedicelli infimi 1½–2 poll. longi. Bracaeæ lanceolatæ 9–12 lin. longæ. Perianthium inodorum pendulum ¾–1 poll. longum segmentis exterioribus oblongo-lanceolatis omnino viridibus, intimis sursum flavo tinctis. Filamenta alterna sterilia. Stylus ovario æquilongus. *Cap. B. Spei.*

6. A. FASTIGIATA, *Dry. Act. Holm.* 1784, 296; *Bot. Rep.* t. 450; *Bot. Reg.* t. 277; *Red. Lil.* t. 474; *Ref. Bot.* t. 44.—Falconera fastigiata, *Salisb. Gen.* 36. Bulbus 2–3 poll. crassus, globosus, apice squa-

mosus. Folia 5–6, lorata planiuscula carnoso-herbacea glabra saturate viridia 12–18 poll. longa, 6–12 lin. lata marginibus obscure ciliatis. Scapus validus subpedalis. Racemus subdeltoideus 12–30-florus, expansus 12–18 poll. longus. Pedicelli ascendentes, infimi 4–6 poll. longi, superiores multo breviores. Bracteæ lanceolatæ 9–12 lin. longæ. Perianthium erectum inodorum 9–12 lin. longum segmentis exterioribus oblongis 3–4 lin. latis albis late viridi-vittatis, interioribus distincte brevioribus. Stamina omnia fertilia antheris alternis minoribus. Stylus 3–4 lin. longus. *Cap. B. Spei herb. Aiton. ex hort. Kew.* 1779! Burchell! Cooper! etc. (*v. v. in hort. Saunders*).

7. A. CAUDATA, *Jacq. Ic.* t. 442; *Kunth, Enum.* iv. 375; *Ref. Bot.* t. 45. Bulbus globosus 2–3 poll. crassus viridis apice squamosus. Folia 4–6 linearia glabra carnoso-herbacea viridia subpedalia 4–6 lin. lata facie canaliculata. Scapus 1–1½-pedalis. Racemus subdeltoideus 6–15-florus, expansus 6–9 poll. longus. Pedicelli diutine ascendentes, infimi 3–4 poll longi. Bracteæ lanceolatæ 9–12 lin. longæ. Perianthium erectum inodorum 9–10 lin. longum segmentis exterioribus albis late viridi-vittatis. Stamina omnia fertilia. Stylus 3–4 lin. longus. Capsula ovoidea 8–9 lin. longa seminibus in loculo 20 vel ultra. *Cap. B. Spei,* Burke! (*v. v. in hort. Saunders, legit Cooper*).

8. A. AUREA, *Jacq. Ic.* t. 441; *Kunth, Enum.* iv. 376. Bulbus globosus 15–18 lin. crassus squamis haud solutis coronatus. Folia 6–9 lorata glabra carnoso-herbacea planiuscula sesquipedalia vel ultra, medio 6–12 lin. lata. Scapus validus pedalis vel ultra. Racemi subdeltoidei 10–30-flori, expansi 12–18 poll. longi. Pedicelli ascendentes, infimi 3–6 poll. longi. Bracteæ lanceolatæ 12–18 lin. longæ. Perianthium erectum inodorum 12–15 lin. longum segmentis exterioribus oblongis obtusis flavis late viridi-vittatis. Stamina omnia fertilia. Stylus 5–6 lin. longus. *Cap. B. Spei,* hort. Burchell, 1817! hort. Saunders, legit Cooper!

9. A. SETOSA, *Jacq. Ic.* t. 440; *Bot. Mag.* t. 1481; *Kunth, Enum.* iv. 375.—Branciona setosa, *Salisb. Gen.* 36. Bulbus emersus 2–3 poll. crassus fibris setosis pluribus coronatus. Folia 6–9 lorata carnoso-herbacea glabra 12–18 poll. longa medio 6–9 lin. lata. Scapus strictus validus 12–18-pollicaris. Racemi laxe 10–30-flori, pedicellis infimis 2–3 poll. longis. Bracteæ lanceolatæ 9–12 lin. longæ. Perianthium erectum leviter odorum 10–12 lin. longum segmentis flavis late viridi-vittatis. Filamenta omnia fertilia. Stylus 4–5 lin. longus. *Cap. B. Spei,* Burchell, hort. Saunders! hort. Kew.!

10. A. TENUIFOLIA, *Baker in Saund. Ref. Bot.* t. 335. Bulbus ovoideus 6–8 lin. crassus membranaceo-tunicatus. Folia 6–9 filiformia 5–6 poll. longa vix ultra ½ lin. crassa facie leviter canaliculata saturate viridia carnoso-herbacea inconspicue glandulosa. Scapus gracilis 4–6-

pollicaris. Flores 3–4 laxe corymbosi. Pedicelli erecto-patentes, infimi 2–3 poll. longi. Bracteæ lanceolatæ 6–8 lin. longæ. Perianthium erectum 8–9 lin. longum flavum. Stamina omnia fertilia. Stylus ovario æquilongus. *Cap. B. Spei,* hort. Saunders, legit MacOwan, *v. v.*

11. A. VISCOSA, *Linn. Suppl.* 126; *Dryand. Act. Holm.* 1784, 297 *Jacq. Ic.* t. 445; *Kunth, Enum.* iv. 377.—Falconera viscosa, *Salisb. Gen.* 36. Bulbus ovoideus 1–1½ poll. crassus apice squamosus. Folia plura lineari-subulata erectiuscula 6–12 poll. longa, 1–2 lin. lata facie profunde canaliculata dense persistenter viscosa. Scapus teres viscosus subpedalis. Racemus laxe 6–12-florus. Pedicelli infimi 1–2 poll. longi viscosi apice cernui. Bracteæ lanceolatæ 6–12 lin. longæ. Perianthium cernuum inodorum 8–10 lin. longum, segmentis exterioribus oblongis albidis late viridi-carinatis intimis flavo-tinctis. Stamina omnia fertilia. Stylus ovario æquilongus. *Cap. B. Spei,* hort. Fothergill, 1781! Burchell, 6222!

12. A. FRAGRANS, *Jacq. Hort. Schoen.* t. 84; *Kunth, Enum.* iv. 376. Bulbus globosus 2 poll. crassus proliferus. Folia 6–8 linearia glabra carnoso-herbacea 1½–2 pedes longa deorsum 6–9 lin. lata extrorsum planiuscula. Scapus teres sesquipedalis. Racemus sublaxe 15–20-florus, expansus ad pedem longus, 3 poll. latus. Pedicelli infimi 12–15 lin. longi, floriferi apice cernui, fructiferi ascendentes. Bracteæ lanceolatæ 3–4 lin. longæ. Perianthium fragrantissimum, 8–9 lin. longum, segmentis exterioribus flavis late viridi-vittatis. Stamina omnia fertilia. Stylus ovario æquilongus. *Cap. B. Spei.*

13. A. SPIRALIS, *Linn. Suppl.* 196; *Thunb. Act. Holm.* 1806, 54. t. 2. fig. 2; *Jacq. Ic.* t. 439; *Kunth, Enum.* iv. 377.—Falconera spiralis, *Salisb. Gen.* 36. Bulbus ovoideus 8–9 lin. crassus, membranaceo-tunicatus. Folia 10–12 subteretia 6–9 lin. longa antice canaliculata carnoso-herbacea dense glanduloso-pubescentia apice circinata. Scapus gracilis 6–8-pollicaris. Racemus laxe 4–6-florus. Pedicelli infimi 8–12 lin. longi, floriferi apice cernui. Bracteæ lanceolatæ 8–9 lin. longæ. Perianthium cernuum inodorum 7–9 lin. longum flavum. Stamina omnia fertilia. *Cap. B. Spei,* Harvey! etc.

14. A. ABYSSINICA, *Dryand. Ait. Holm.* 1784, 297; *Jacq. Ic.* t. 64; *Red. Lil.* t. 195; *Kunth, Enum.* iv. 376.—Pallastema abyssinica, *Salisb. Gen.* 36. Bulbus globosus 1½–2 poll. crassus. Folia 6–8 carnoso-herbacea glabra 2–3 pedes longa 6–12 lin. lata lineari-lorata ad apicem sensim angustata. Scapus validus strictus teres crassitie calami 2–4-pedalis. Racemus subdense 30–50-florus vel ultra, expansus 6–12 poll. longus 2 poll. latus. Pedicelli ascendentes 3–6 lin. longi. Bracteæ lineari-subulatæ 1–2 poll. longæ ante florescentiam conspicuæ. Perianthium inodorum 8–9 lin. longum, segmentis lanceolatis luteis

dorso late viridibus 8–9-nervatis 2–2½ lin. latis. Filamenta 6–7 lin. longa omnia fertilia, basi lanceolata, alterna latiora. Stylus filiformis 6–7 lin. longus. *Abyssinia*, Plowden! Schimper, 756! etc.

15. A. ANGOLENSIS, *Welw. in Saund. Ref. Bot.* t. 336. Bulbus maximus. Folia 6–8 carnoso-herbacea glabra pallide viridia 1½–2 pedes longa lineari-lorata 1 poll. lata ad apicem sensim angustata. Scapus validus teres strictus 4–6-pedalis. Racemus cylindricus densiflorus 1–1½ pedem longus expansus 2½–3 poll. latus. Pedicelli 3–6 lin. longi. Bracteæ lineares vel lanceolatæ-cuspidatæ floribus expansis æquilongæ vel superantes. Perianthium 10–14 lin. longum segmentis luteis late viridi-vittatis multinervatis. Filamenta omnia fertilia, basi lanceolata, dimidio superiore filiformia. Stylus filiformis 6–7 lin. longus. *Angola*, Welwitsch! (*v. v. in hort. Saund.*).

16. A. BAINESII, *Baker*. Folia glabra carnoso-herbacea 1½–2 pedes longa lineari-lorata 8–12 lin. lata. Scapus * * * Racemus expansus 15–18 poll. longus, 2½–3 poll. latus, rachi valida sulcata deorsum 5–6 lin. crassa, subdense 40–60-florus. Pedicelli infimi 12–15 lin. longi demum stricti erecto-patentes. Bracteæ lineares 1 poll. longæ ante florescentiam conspicuæ. Perianthium 12–15 lin. longum segmentis oblongis 4–4½ lin. latis flavis dorso late viridibus distincte 8–12-nervatis. Filamenta 9–10 lin. longa basi lanceolata. Stylus filiformis 8–9 lin. longus. *Africa austro-tropicalis centralis prope Koobie*, Baines!

Species dubia.

A. PARVIFLORA, *Don, Dietr. Gart. Lex.* edit. 2, i. 237; *Kunth, Enum.* iv. 377. Bulbus subrotundus. Scapus erectus 6–10-pollicaris. Flores parvi flavescenti-virides subsessiles. Bracteæ parvæ angustæ acuminatæ. *Cap. B. Spei* (non vidi).

Species exclusæ.

A.? GARDENI, *Hook. Bot. Mag.* t. 4842 (planta chinensis, non natalensis, ut dicitur) est verisimiliter *Theropogonis* species nova; sed fructum non vidi. *A. physodes, fugax, filifolia,* et *exuviata,* Gawl., sunt *Urgineæ* species.

35. BOWIEA, *Harv.*

Harv. in Bot. Mag. sub t. 5619; *Cap. Gen.* edit. 2, 401, non *Haworth in Phil. Mag.* Oct. 1824, 299.

Perianthium basi connatum segmentis 6 æqualibus marcescentibus anguste ligulatis viridibus dorso distincte 1-nervatis flore expanso rotatim patentibus vel leviter reflexis. *Stamiaa* 6 uniseriata perigyna filamentis filiformibus segmentis subduplo brevioribus, *antheris* oblongis versatilibus. *Ovarium* sessile ovoideum triloculare ovulis in loculo pluribus; *stylus* rectus brevis filiformis; *stigma* capitatum. *Capsula* ovoidea membranacea loculicide trivalvis, seminibus in loculo 5–6 parvis oblongis compressis. *Testa* nitida nigra membranacea.

1. B. VOLUBILIS, *Harv. Bot. Mag.* t. 5619. Bulbus viridis squamosus globosus 4–5 poll. crassus. Folia 2 erecta linearia parva carnoso-herbacea cito evanescentia. Caulis more Asparagi vage volubilis copiose irregulariter ramosus ramulis floriferis racemosis et sterilibus copiosis viridibus carnosis dichotome furcatis. Pedicelli 6–18 lin. longi haud articulati. Bracteæ minutæ lanceolatæ membranaceæ basi calcaratæ. Perianthium 3–4 lin. longum segmentis ½ lin. latis. Capsula 4–6 lin. longa. *Natalia,* Cooper! M'Ken! Buchanan, etc. *Kaffraria,* Hutton! Barber, 892! (*v. v. in hort. Kew. et Saundersii*).

36. CHLOROGALUM, *Kunth.*

Kunth, Enum. iv. 681; *Torrey, Bot. Mex. Bound.* 218, t. 60.—Ornithogalum, § Chlorogalum, *Lindl. Bot. Mag.* xxviii. sub t. 28.—Antherici, Phalangii, et Scillæ sp., *Auct.*

Perianthium basi 6-partitum segmentis subæqualibns lineari-ligulatis albidis dorso vittatis confertim 3–6-nervatis flore expanso falcatis. *Stamina* 6 e basi segmentorum subuniseriata filamentis filiformibus segmentis brevioribus; *antheris* lineari-oblongis versatilibus. *Ovarium* sessile globosum triloculare loculis biovulatis; *stylus* filiformis rectus vel leviter curvatus; *stigma* tricuspidatum. *Capsula* turbinata parva sessilis loculicide trivalvis, seminibus in loculo 1–2 obovoideo-triquetris. *Testa* nigra membranacea. *Herbæ bulbosæ foliis duris synanthiis caule bracteato floribus laxe racemoso-paniculatis teneris albidis anthericoideis pedicellis apice articulatis.*

Bulbus apice fibris duris coronatus........ 1. *pomeridianum.*
Bulbus apice fibris nullis coronatus ...... 2. *angustifolium.*

1. C. POMERIDIANUM, *Kunth, Enum.* iv. 682; *Torrey, Bot. Mex. Bound.* 218, t. 60.—Anthericum pomeridianum, *Gawl. Bot. Reg.* t. 564.—Scilla pomeridiana, *DC. in Red. Lil.* t. 421.—Phalangium pomeridianum, *D. Don in Sweet, Flow. Gard.* ii. t. 381.—C. divaricatum, *Kunth, loc. cit.*—Ornithogalum divaricatum, *Lindl. Bot. Reg.* xxviii. t. 28. Bulbus elongato-ovoideus, tunicis extimis apice in fibras copiosas setosas persistentes solutis. Folia radicalia plura

ineari-ligulata 12–18 poll. longa medio 8–10 lin. lata glabra multinervata marginibus valde undulatis. Scapus (panicula inclusa) 2–3-pedalis. Racemi 6–18 poll. longi, 12–30-flori, expansi 1½–2 poll. lati. Pedicelli ascendentes 6–9 lin. longi, raro geminati. Bracteæ lanceolatæ 1–1½ lin. longæ. Perianthium 8–9 lin. longum, segmentis 1–1½ lin. latis dorso 4–6-nervatis flore expanso revolutis. *California*, Fremont! W. Lobb! etc. Ubi vocatur "Soap-plant" ob succum copiosum saponaceum bulborum.

2. C. ANGUSTIFOLIUM, *Kellogg, Proc. Calif. Acad.* ii. 104, t. 30. Bulbus breviter ovoideus, tunicis apice nullo modo setosis. Folia minora angustiora 4–8 poll. longa medio 3–4 lin. lata, margine vix undulata. Scapus, panicula inclusa, 2–3-pedalis. Paniculæ rami multi erecto-patentes. Pedicelli semper solitarii 1–3 lin. longi. Bracteæ lanceolatæ 2–3 lin. longæ. Perianthium 6–7 lin. longum segmentis dorso trinervatis flore expanso haud revolutis. *California*, Dr. Kellogg (non vidi).

37. NOLINA, *Rich.*

Rich. in Michx. Flor. Amer. i. 208; *Endlich. Gen.* no. 1064; *Kunth, Enum.* iv. 656; *Chap. Flor. S. U. S.* 483.—Nolinæa, *Pers. Ench.* i. 399.—Phalangii sp., *Lam.*

Perianthium 6-partitum segmentis 6 æqualibus oblongo-lanceolatis albidis marcescentibus dorso 1-nervatis flore expanso reflexis. *Stamina* 6 perigyna uniseriata filamentis filiformibus segmentis brevioribus antheris oblongis versatilibus. *Ovarium* sessile ovoideum triloculare ovulis in loculo geminis collateralibus; *stylus* subnullus; *stigma* peltatum tricuspidatum. *Capsula* parva membranacea ovoidea septicide trivalvis, seminibus in loculo solitariis parvis obovoideo-oblongis haud compressis, loculis 1–2 sæpe abortivis.

1. N. GEORGINA, *Rich. in Michx. Flora*, i. 208; *Pursh, Flora*, i. 240, ii. 746; *Kunth, Enum.* iv. 656; *Chapman, Flora*, 483.—Phalangium virgatum, *Lam. Encyc.* v. 246. Bulbus magnus tunicatus. Folia radicalia 1–2 pedes longa 1½–2 lin. lata anguste ligulata coriacea distincte paucinervata margine denticulata. Caulis copiose bracteatus, panicula inclusa, 2–3-pedalis. Paniculæ rami multi erecto-patentes floribus copiosis superne subdensis inferne laxioribus. Pedicelli erecto-patentes apice articulati 1–3 lin. longi, inferiores geminati. Bracteæ lanceolatæ persistentes 1–1½ lin. longæ. Perianthium 1½ lin. longum. *Georgia*, Dr. Boykin! etc.

New Species of Musci collected in Ceylon by Dr. Thwaites.

Described by W. Mitten, A.L.S.

[Read June 20, 1872.]

Since the "Enumeration of the Mosses of the East Indies" in the 'Journal of the Proceedings of the Linnean Society' in 1859, considerable additions have been made to the flora of Ceylon through the species described by Dr. Carl Müller (Linnæa, Band 36) from the collections made by Dr. Neitner; and by the species described in the following pages Ceylon appears to have a rich moss-flora, approaching to that of the Indian archipelago by the presence of species of *Garovaglia*, numerous forms of *Syrrhopodon*, and *Calymperes*, of those species of *Macromitrium* which have curved cells in the lower portion of the leaf, and of species of *Chætomitrium*.

Among the species recently added to the flora of Ceylon by Dr. Thwaites there are some whose presence is very remarkable; of these, one is a *Leptostomum*, a genus of few species before confined to Australia, Tasmania, New Zealand, and the western coast of South America, the new species differing only in small particulars from those previously known. The presence of this austral form in Ceylon seems analogous to that of the moss which was enumerated in the "Musci Indici" as *Phyllogonium elegans*, and supposed to be identical with the species so named and figured in that part of the Antarctic flora containing the flora of New Zealand, and for which Reichardt has proposed the genus *Orthorhynchium*, "perist. simpl. dent. ext. 16 æquidistantes sæpe confluentes cartaliginei. Calyptra mitriformis campanulata multoties laciniata. Columella exserta." And C. Müller, Linn. Band xxxvi. p. 28 (from whom I have taken the above characters), in the same place, points out the distinctions by which the original species *O. elegans* differs from the Ceylon moss which he describes as *O. Neitneri*, the most important difference being derived from the imbrication of the terminal bud at the apex of the shoots, which is said to be open in *O. elegans* and closed in *O. Neitneri*, a distinction which I have failed to verify. Two other species are also at the same time described as belonging to this genus:—*O. Hampeanum* from Sealer's Cove, Australia Felix, Dr. Mueller, the description of which agrees so well with *Acrocladium politum* (Hook. fil. et Wils.), a moss which Dr. Mueller has several times sent from other localities, that it may be feared it has been again mistaken as it was by Dr. Montagne, when he described it as *Phyllogonium callichroum*; indeed, so close is the resemblance of the foliage of this moss to that of the Phyllogonia, that the barren stems might well be supposed to belong to a species of that genus. The remaining species, ascribed to *Orthorhynchium*, is a barren moss from the Philippine Islands (*O. philippinense*); and its description offers no positive difference whereby it may be distinguished from the *Neckera phyllogonioides*, Sull. United St. Exped. t. 17, which was also obtained in the same islands. Of the genus *Orthorhynchium* itself, it appears that the chief distinction exists in the striation of the calyptra, which is really like that of *Orthotrichum*, and covers a great portion of the capsule; whereas in the other Phyllogonia this organ is small and smooth; in *P. angustifolium* it covers only the short beak of the operculum, and in this particular is similar to that of some Fissidentes, in which the calyptra, being too short to be affected by the growth of the capsule, remains unsplit.

The occurrence of another species of the genus *Sphærothecium* in Ceylon is a curious circumstance, which prompts the inference that among the *Campylopus*-like barren mosses of the European and Indian mountains some further species may be found with the curious inconspicuous phascoid fruit. All the descriptions of the species about to be mentioned have been drawn up by me; and for any errors or oversights in their definition I am alone responsible; but as many of the species had already been clearly distinguished by Dr. Thwaites, it has been arranged that our joint names should be attached to them, which appears to me a very small tribute to the energy with which he has investigated the flora of Ceylon. A few species nearly allied to several Ceylon mosses, but hitherto undescribed, have been added from various sources.

Hurstpierpoint, June 1872.

SPHÆROTHECIUM, *Hamp. in Triana et Planchon, Fl. Nov. Granat Musci*, p. 25.

S. RECONDITUM, *Thw. et Mitt.*

Cæspitosum, humile; caulis superne ramulis fertilibus pluribus in comam congestis divisus; folia inferiora erecto-patentia anguste lanceolata subulato-acuminata canaliculata, margine integerrimo, lævia, nervo inferne $\frac{2}{4}$ folii latitudinis occupante, usque fere ad apicem a pagina distincto, cellulis basalibus rubro-fuscis inde oblongis rectangulis pellucidis superne in parvas oblongas obliquas obscuras densas transeunti-

bus; folia comalia perichætialia subduplo longiora, interiora basi latiora, ovalia, convolutacea, exinde in subulam canaliculatam e nervo fere omnino constitutam producta, margine versus apicem serrulata; theca in pedunculo brevi pallido cygnicolli-flexo globoso-ovalis, operculo parvo acumine obliquo, peristomio dentibus pallidis brevibus fugacibus annulo lato fere obtectis; calyptra parva ad thecæ medium descendens, fimbriata.

Hab. Ins. Ceylon, in collibus altioribus ad rivulorum margines et in declivibus humidis haud rarum. *Dr. Thwaites.*

Caulis 1–3 lineas altus. *Folia* comalia bilinearia stramineo-viridia rigidiuscula subnitida. *Pedunculus* theca duplo longior.

Very much resembling *S. comosum*, Hampe, from the Bogotan Andes, but with leaves which, when flattened, are more nearly lanceolate, with laxer and more pellucid cells. Another specimen, without fruit, has been sent by Dr. Thwaites; but it does not offer sufficient characters to distinguish it as a distinct species, although it has much the appearance of being so.

DICRANELLA, *C. Müll.*

D. EDENTATA, *Thw. et Mitt.*

Caulis fertilis brevis, innovationibus infra perichætium oriundis ramosus; folia laxe disposita patentia, a basi caulis sensim angustata, acuta, nervo crassiusculo fere ad apicem usque a pagina distincto carinata, canaliculata, margine angusto implano integerrimo, cellulis basi ad angulos latioribus oblongis rectangulis, reliquis elongatis angustis; perichætialia duplo longiora, a basi latiora ovata, subula fere omnino e nervo formata angustiore attenuata; theca in pedunculo brevi pallido, globoso-ovalis erecta gymnostoma, operculo longe oblique rostrato.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Plantula vix lineas tres alta, cujus pedunculus bilinearis est. *Folia* caulina semilineam longa, perichætialia interna sesquilineam longa, omnia luteo-viridia fuscescentia nitida. *Theca* intense fusca ore satis parvo, operculo a basi depresso subito rostro constricto.

D. INFUSCATA, *Thw. et Mitt.*

Monoica; caulis humilis; folia patentia a basi sensim angustata, anguste elongata canaliculata integerrima, nervo angusto ad apicem usque a pagina distincto, cellulis angustis elongatis areolata, perichætialia a basi subovata convoluta sensim attenuata; theca in pedunculo breviusculo recto, ovali-cylindracea erecta æqualis pallida lævis, operculo subulato obliquo; peristomii dentes breves integri.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Caulis 2-3 lineas altus. *Folia* vix sesquilineam longa viridia. *Pedunculus* 3-4 lineas longus fuscus.

Similar to *D. Perrottetii* (Mont.) and unlike any other Indian species.

D. SUBANGULATA, *Thw. et Mitt.*

Dioica, humilis; folia patentia, comalia secunda subfalcata, inferiora a basi sensim subulato-angustata integerrima, nervo lato fere usque ad apicem distincto, cellulis elongatis angustis areolata; perichætialia a basi obovata convolutacea in subulam elongatam fere omnino e nervo constitutam producta; theca in pedunculo brevi, sicca et madida rectiuscula, elliptica ovalisve, erecta, subangulata, operculo subulato oblique curvato; peristomium brevissimum, dentibus brevibus irregularibus incompletis.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Caulis trilinearis. *Folia* inferiora lineam longa, superiora bilinearia, fusco-viridia. *Pedunculus* lineas duas longus pallidus.

CYNONTODIUM, *Hedw.*

C. AMŒNUM, *Thw. et Mitt.*

Monoicum; caulis humilis; folia sparsa, erecto-patentia, anguste lanceolata, sensim angustata, nervo vix a pagina distincto carinata, apice parce denticulata, cellulis inferne angustis, superne sensim abbreviatis, omnibus concoloribus; comalia longiora; perichætialia interna basi ovalia convolutacea, nervo in subulam excurrente; theca in pedunculo pallido, oblongo-cylindracea, operculo conico acuminato obliquo; peristomium parvum dentibus brevibus valde irregularibus angustissimis rubris, annulo lato circumdatis; flos masculus gemmiformis, ad basin perichætii in ramulo brevissimo impositus.

Hab. Ins. Ceylon! Newera Ellia etc. in declivibus. *Dr. Thwaites.*

Caulis 4 lineas altus, gracillimus. *Folia* inferiora lineam longa, fuscescentia, superiora seu comalia bilinearia, pallide viridia, sicca parum curvata. *Pedunculus* 4-5 lineas altus. *Theca* lineam longa pallide castanea, sicca subplicata.

C. stricto Americæ australis simile.

DICRANUM, *Hedw.*

D. DECUMBENS, *Thw. et Mitt.*

Dioicum; caulis decumbens divisus; folia falcato-secunda, a basi subovata sensim longe angustata, canaliculata, nervo versus apicem angustum a pagina indistincto, margineque incurvo integerrima subintegerrimave, cellulis alaribus pluribus quadratis, superioribus angustis elongatis, altioribus abbreviatis; perichætialia longiora latioraque, apicibus margine dorsoque serrulatis; theca in pedunculo elongato, oblonga, curvata, sicca et evacua pluries plicata, leptodermis, basi callosa, ore obliquo.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Caulis semiunciam altus. *Folia* bilinearia, fusco-viridia absque nitore, siccatione vix mutata. *Pedunculus* 9 lineas longus, ruber. *Theca* evacua pallide fusca, membranacea.

This moss nearly resembles in size and general appearance *D. virens*, Hedw.; but its foliage is less curled, and the leaves are more narrow towards their points.

CAMPYLOPUS, *Brid.*

C. SUBULIFOLIUS, *Thw. et Mitt.*

Caulis rigidus, radicellis rubrofuscis tomentosus; folia sparsa patentia, inferne lanceolata, superne subulato-angustata, stricta, canaliculato-concava, nervo inferne $\frac{2}{4}$ folii latitudinis, superne fere totam partem subulatam occupante, dorso apicem versus lamellis paucis humilibus parce denticulatis alato, margine erecto apice serrulato, cellulis alaribus pluribus quadratis rubro-fuscis, inde viridibus angustis sensim in ovales minutas transeuntibus; perichætialia basi ovalia convoluta, nervo in subulam angustiorem longiorem magis serrulatam educto; theca ovalis gibba, ore obliquo, operculo rostrato, calyptra fimbriata.

Hab. Ins. Ceylon.

Caulis unciam altus. *Folia* lineas duas longa, superiora luteo-viridia, inferiora fuscescentia, omnia apicibus concoloribus.

PŒCILOPHYLLUM, *Mitt. Musc. Austr. Amer.* 92.

P. NITENS, *Thw. et Mitt.*

Cæspitosum; caulis gracilis subsimplex fusco-ruber; folia erecto-patentia subsecunda, apicalia curvata secunda, sicca medio inflexa plana laxe contorta, elliptico-lanceolata, subulato-attenuata, nervo hyalino nitido usque fere ad summum apicem a pagina planiuscula distincto, margine apice minute denticulata, cellulis alaribus pluribus quadratis oblongisque flavis, superioribus ad marginem angustissimis hyalinis, in limbum latum nitidum usque ad $\frac{2}{3}$ folii longitudinis inferne $\frac{2}{4}$ folii latitudinis occupantem productum conflatis, interioribus minutissimis rotundis obscuris areolata.

Hab. Ins. Ceylon Prov. central. in collibus altioribus, ad arborum truncos late cæspitosum, vulgatissimum. *Dr. Thwaites.*

Caulis subuncialis. *Folia* sesquilineam longa, pallide luteo-viridia, subglauca, nervo limboque marginali nitidis.

Nearly resembling *P. amœne-virens*, Mitt. Musc. Ind. Or. (*Leucoloma*), but with a much broader band of hyaline cells on the margins of its leaves.

OCTOBLEPHARUM, *Hedw.*

O. RADULA, *Thw. et Mitt.*

Caulis gracilis ruber furcatim divisus; folia a basi oblonga, erecta, parum latiora, superne margine denticulis ciliata integerrimave, cellulis hyalinis areolata, exinde patentia subsemitorta sensim angustata, nervo crasso obscuriusculo subtrigono-tereti intus extusque setulis brevibus papilloso, apicem versus excurrente ibique denticulato percursa, et præterea laminam angustam pellucidam e cellula singula latam, utroque latere lævem, foliorum partem superiorem totam constituente, limbo marginali angustissimo subserrulato circumdata nec nisi læsione cernenda.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Caulis unciam altus. *Folia* sesquilineam longa, cujus $\frac{2}{5}$ erecta, reliqua patentia, albida, siccatione immutata.

O. scabro, *Mitt. Linn. Soc. Jl.* vol. x. p. 178, simillimum, neque præter structuram partis foliorum superioris distinguendum.

SYRRHOPODON, *Schwægr. Suppl.* ii. 110.

Eusyrrhopodon, *Mitt. Musc. Austr. Amer.* 113.

S. ALBIDUS, *Thw. et Mitt.*

Caulis gracilis elongatus; folia sparsa tertia parte inferiore eorum longitudinis erecta, cauli appressa suboblonga, superne latiora, cellulis hyalinis areolata, inde in folium patens lineare planiusculum apice obtusum denticulatum producta, margine limbo angusto cartilagineo ubique circumdata, integerrima, nervo lævi percursa, cellulis rotundis obscuris præcipue extus protuberantibus papillosa.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Caulis 1–1½ unciam altus. *Folia* vix bilinearia albida dilutissime viridi tincta, sicca vel humida patentia immutata.

In habit this species resembles *S. tristichus*, Nees, but is more slender and of a paler colour.

S. CÆSPITOSUS, *Thw. et Mitt.*

Dense cæspitosus, mollis; caulis elongatus furcatim ramosus ruber; folia dense inserta erecto-patentia laxe imbricata anguste lanceolata acuta obtusiusculave planiuscula inferne canaliculata, nervo angusto pallido percursa, dorso in folii medium papillis scabro, cæteroquin lævi, margine limbo angusto pallido, a folii medio minute, apice evidentius serrulato, cellulis hyalinis ultra folii medium longitudinis ascendentibus, superioribus minutis obscuris intus extusque minute papilliferis.

Hab. Ins. Ceylon, regio subtropica. *Dr. Thwaites.*

Caulis unciam altus. *Folia* sesquilineam longa, inferne albida, superne pallidissime glauco-viridia, exsiccatione directione parum mutata.

Larger than *S. rufescens*, Hook. et Grev., but with narrower leaves.

S. STRICTUS, *Thw. et Mitt.*

Caulis furcatim divisus; folia patentia, stricta, a basi suboblonga erectiora, superne margine denticulis pluribus brevibus ciliata, inde in folium lineare elongatum rigidum angustata, apicem versus angustiora subabrupta, inferiora nonnulla aliquantulum infra apicem subspathulatim dilatata, omnia margine incrassato tereti, remote denticulato et scabroso, nervo supra partem folii erectiorem intus extusque minutissime denticulato scabrosulo, cellulis superioribus minutis obscuris, inferioribus hyalinis fere totam partem erectiorem folii occupantibus: perichætia ad apicem caulis sæpe plura; folia parte inferiore latiora, longiora, sensim angustata, margine incrassato plus minus obsoleto: theca in pedunculo brevi rubro cylindracea, operculo subulato subæquilongo; peristomii parvi dentes breves irregulares angusti; calyptra superne subscabra.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Caulis semiuncia parum altior. *Folia* lineas tres longa, pallidissime luteo-viridi-glauca, statu sicco vel humido vix mutata. *Pedunculus* trilinearis. *Theca* fusca.

Thyridium, *Mitt. Musc. Austr. Amer.* 114.

S. PARVULUS, *Thw. et Mitt.*

Caulis repens, ramis brevibus ramulosis in stratum humile congestis; folia dense inserta, a basi ad insertionem cuneatim angustata, erecta, subovata, cellulis anguste oblongis elongatisque hyalinis areolata, inde patentia ligulata apice lata apiculo brevissimo terminata, margine flexuoso incurvo, limbo pellucido supra folii basin latiore ibique denticulis brevibus serrato, infra apicem evanescente marginata, nervo concolori percursa, cellulis superioribus minutis rotundis obscuris lævibus; perichætialia basi latiora, cæteroquin caulinis similia; theca in pedunculo gracili rubro, ovalis, collo sensim angustato, operculo subulato, thecæ longitudine; peristomii dentes aurantiaci; calyptra superne scabra.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Rami circiter bilineares. *Folia* lineam longa, inferiora fusca, apicalia luteo-viridia, sicca incurvo-crispata.

SYSTEGIUM, *Schimper.*

S. ABBREVIATUM, *Thw. et Mitt.*

Subacaulis, simplex; folia inferiora patula incurva inferne parum latiora cellulis inferioribus oblongis rectangulis hyalinis, superne marginibus usque ad apicem inflexis canaliculata cellulis rotundatis obscuris papillosis areolata, nervo flavescente in mucronem excurrente carinata, margine ob papillas crenulata; perichætialia erectiora, duplo longiora, dimidio inferiore subelliptico concavo pellucide areolato, exinde ad apicem caulinis similia; theca in pedunculo brevissimo subsessilis, globoso-ovalis, rostello brevi erecto subobliquove terminata, calyptra parva plus minus profunde fissa; flos masculus foliis internis elongatis marginibus haud inflexis.

Hab. Ins. Ceylon, ad terram. *Dr. Thwaites.*

Plantulæ cum foliis lineam parum superantes. *Folia* perichætialia circiter lineam longa, omnia siccitate crispata viridia. *Theca* ob brevitatem pedunculi fere immersa.

TORTULA, *Hedw. Fund.* 11. 92.

Helicopodon, *Mitt. Musc. Austr. Amer.* 142.

T. CONSANGUINEA, *Thw. et Mitt.*

Dioica, humilis; folia a basi parum erectiora, patentia, oblonga, obtuse acuta, integerrima, nervo percurrente dorso superne scabro, cellulis superioribus parvis rotundatis, inferioribus oblongis pellucidis, partem quartam folii longitudinis occupantibus, omnibus limitibus angustis distinctis; perichætialia inferne latiora, pellucidiora, ovato-oblonga, cæteroquin conformia; theca in pedunculo rubro, oblongo-cylindracea, operculo subulato; peristomium thecæ longitudine æquale, bis tortum; flos masculus satis magnus, foliis basi dilatatis cinctus.

Hab. Ins. Ceylon, ad terram. *Dr. Thwaites.*

Caulis 3–6 lineas altus. *Folia* semilineam longa, pallide glauco-viridia, sicca appressa curvata. *Pedunculus* sexlinearis.

MACROMITRIUM, *Brid.* i. 306.

Goniostoma, *Mitt. Musc. Austr. Amer.* 194.

M. ANGULOSUM, *Thw. et Mitt.*

Rami humiles, ramosi; folia patentia, incurva, ligulata, obtusa, nervo percurrente carinata, integerrima, cellulis rotundis obscuriusculis, basalibus paucissimis oblongis pallidioribus; perichætialia breviora, lanceolata, acuta; theca in pedunculo breviusculo, sicca tetragono-ovalis, per longitudinem plicata, collo sensim angustato; calyptra nuda.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Rami 2–3 lineas longi. *Folia* lineam longa, viridia, siccitate crispata, humida apicalia sæpe apicibus incurvis. Pedunculus trilinearis, crassiusculus. *Theca* humida lævis, sicca ore plicis contractis clausa.

This nearly resembles *M. goniopodum*, Mitt. Musc. Aust. Amer. 198, but has its leaves wider at their apices, and the capsule has a longer neck.

Leiostoma, *Mitt. Musc. Austr. Amer.* 194.

M. RAMENTOSUM, *Thw. et Mitt.*

Rami crassiusculi, ramosi; folia patentia, elongate lanceolata, apice latiuscula acuta, nervo in apiculum brevem excurrente carinata, integerrima, cellulis superioribus minutis rotundis distinctis, inferioribus basin versus oblongis elongatisque angustissimis, intus parce papilliferis, basalibus ad nervum præcipue uno latere majoribus oblongis dilatatis pellucidis; perichætialia vix breviora, subovata acuta; theca in pedunculo breviusculo ovata, plicata, operculo acuminato rostrato; peristomii dentes truncati, geminati; calyptra infra basin thecæ descendens, ramentis flavis rufisve obtecta.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Rami $\frac{1}{2}$–1 unciam alti. *Folia* bilinearia, apicalia viridia, inferiora fuscescentia, omnia subnitida, siccitate laxe crispato-contorta. *Pedunculus* 4 lineas longus. *Calyptra* straminea, fulvescens.

In size and appearance like *M. sulcatum* (Hook.), but with leaves narrowed above their middle.

M. CONTORTUM, *Thw. et Mitt.*

Rami abbreviati; folia densa, patentia, sicca in spiram apice acutam contorta, subovato-lanceolata obtusa, nervo in mucronem pungentem excurrente carinata, margine inferne uno latere recurvo, integerrima, cellulis inferioribus pellucidis fere ad folii longitudinis medium usque ascendentibus, basalibus oblongis, sensim superne abbreviatis rotundis, supra folii medium rotundatis obscuris; perichætialia æquilonga, ovata sensim acuminata; theca in pedunculo angulato, breviter ovalis, lævis, sicca sub ore rotundo contracta, operculo conico rostrato; peristomium membrana brevissima indivisa; calyptra nuda.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Rami bilineares. *Folia* juniora viridia, seniora fusca, longitudine lineam dimidiam parum excedentia, tenaci-nervia, difficillime a caule separanda. *Pedunculus* quadrilinearis, ruber.

Allied to *M. Blumei*, Nees ab E., and to *M. concinnum*, Mitt. Bry. Javan. t. 110, but with the nerve of the leaf more excurrent.

M. hispidulum and *M. seminudum*, together with *M. angulatum* (Mitt. Linn. Soc. Journ. vol. x. p. 167) and the species named by Nees von Esenbeck *M. orthostichum*, as well as a few others, form a small group which does not very closely approach any other section of the extensive genus *Macromitrium*. In habit, these species resemble some of those like *M. gracile*, which belong to the section with curved cells in the lower part of the leaf; but the areolation of the leaves is very different, the narrow cells being nearly or quite absent. The following is an outline of this division:—

Macromitrium, sectio nov. *Cometium.*

Rami graciles, dichotome fasciculatimve ramosi. *Folia* seriatim dispositi, e cellulis rotundatis areolata. *Theca* in pedunculo breviusculo quadrangulo scabro, brevis, sicca 4–6-plicata lævisve. *Calyptra* ramentis inferioribus divaricatis.

* Folia perichætialia vaginula breviora.

M. orthostichum, Nees ab E.
M. appressifolium, sp. nov.
M. hispidulum, sp. nov.
M. angulatum, Mitt.

** Folia perichætialia vaginulæ æqualia.

M. seminudum, sp. nov.

*** Folia perichætialia vaginula longiora.

M. minutum, sp. nov.

M. ORTHOSTICHUM, *Nees ab E.*; *Schwaegr. Supp.* t. 316.

Folia dense inserta, a basi brevi erecta squarroso-patula, semitorta, sicca curvata recurvave subsquarrosa, elongate lanceolata, apice obtusiuscula, nervo in mucronem brevem excurrente carinata, margine crenulata, basin versus subrecurva, cellulis rotundatis, basalibus infimis paucissimis oblongis; perichætialia conformia, vaginula breviora; calyptra ramentis latis copiosis, superioribus appressis, inferioribus divergentibus decurvisque dentatis.

Hab. Java (*ex herb. Nees*) in mont. Megamendong et Paroerongo reg. sup. alt. 7000–10,000′, *Motley.*

M. APPRESSIFOLIUM, *Mitt.*

Folia approximata, a basi brevissima vix erectiore patula, recurva, subsemitorta, sicca contorta appressa, oblongo-lanceolata obtusa, nervo in mucronem brevem excurrente, margine crenulata, cellulis omnibus rotundo-quadratis; perichætialia similia, vaginula breviora; calyptra ramentis superioribus appressis, inferioribus decurvis denticulatis.—M. orthostichum, *Bryol. Javanica,* t. 107.

Hab. Java (*ex herb. Dozy et Molkenboer*).

M. orthosticho simile, foliis autem siccis appressis brevioribus, ramentisque calyptræ minus copiosis.

M. HISPIDULUM, *Thw. et Mitt.*

Rami graciles, in cæspites luteos aggregati, ramosi; folia in series quinas erectas disposita, a basi brevi erectiore recurva, patentia, oblongo-lanceolata, apice acuta obtusiusculave breviter acuminata, nervo rufescente carinata, planiuscula, margine ob cellulas prominulas minute apice distinctius crenulata, cellulis ubique rotundatis obscuris papillosis areolata; perichætialia longiora, erecta, angustiora; theca in pedunculo brevi scabro, ovali-pyriformis, ore parvo sicco rotundo, operculo rostrato; peristomium membrana brevissima truncata; calyptra ramentis crassiusculis denticulatis, superioribus appressis, inferioribus divergentibus, basalibus dependentibus obtecta.

Hab. Ins. Ceylon, *Dr. Thwaites*; Central Prov. Ettangwala, alt. 3000′, on trees, *Mr. Beckett.*

Rami semiunciales uncialesve. *Folia* in ramorum apicibus viridia, reliqua ferruginea, sicca contorta, semilineam longa. *Pedunculus* lineam longus.

M. SEMINUDUM, *Thw. et Mitt.*

Rami cæspitosi ramosi; folia in series quinas rectas disposita, a basi brevi erectiore patentia, oblongo-ligulata, apice acuta brevissime acuminatave, nervo concolori subexcurrente, margine minute serrulato planiusculo, cellulis conformibus papillosis rotundis obscuriusculis areolata; perichætialia longiora, conformia; theca in pedunculo brevi scabro, late ovalis, sicca ovata, ore parvo siccitate plicis quatuor clauso; operculum rostratum; peristomium membrana brevissima truncata; calyptra supra medium nuda, infra ramentis recurvis denticulatis vestita.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Rami semiunciales, *Folia* $\frac{2}{3}$ lineam longa, superiora viridia mox fulvescentia, sicca contorta. *Pedunculus* sesquilineam longus, crassiusculus. *Theca* satis magna, cinnamomea.

Leaves longer than in *M. hispidulum*, papillæ less prominent, capsule larger.

M. MINUTUM, *Mitt.*

Folia approximata, a basi brevi erecta patentia patulave, sicca appressa contorta, elongate lanceolata, apice latiusculo, nervo fusco in acumen longiusculum denticulatum excurrente carinata, margine crenulata, apice serrulata, cellulis rotundatis, basalibus infimis paucis oblongis; perichætialia elongata, vaginula duplo longiora, conformia; calyptra ramentis superioribus appressis, inferioribus decurvis.

Hab. Java, in Mont. Megamendong, alt. 4000′–7000′, *Motley.*

M. orthosticho M. appressifolioque minus, foliis quoad latitudinem longioribus acutioribusque.

ZYGODON, *Hook. et Tayl. Musc. Brit.* 70.

Z. PERPUSILLUS, *Thw. et Mitt.*

Monoicus; caulis brevissimus; folia patentia, apice subrecurva, late spathulata, acutiuscula, canaliculata, nervo infra apicem evanescente, margine apicis integerrimo subcrenatove; comalia majora, obtusiora, cellulis mollibus carnosulis, superioribus rotundis obscuriusculis, inferioribus oblongis rectangulis hyalinis; perichætialia tria erecta, intima ovato-lanceolata obtusiuscula, inferne convoluta, apicibus basin thecæ ovalis brevicollis octoplicatæ attingentibus; operculum convexo-acuminatum; peristomium dentibus latis 8, ciliis nullis.

Hab. Ins. Ceylon, ad corticem, *Dr. Thwaites.*

Caulis linea brevior, inferne radiculis rubris parce obtectus. *Folia* semilineam longa, mollia, viridissima, haud papillosa. *Pedunculus* linea brevior, pallidus. *Theca* fusca, collo brevissimo.

Z. HUMILIS, *Thw. et Mitt.*

Dioicus, parvulus; folia erecto-patentia, sublanceolato-ligulata, acuminata, nervo lato in acumen excurrente carinata, margine integerrimo, cellulis superioribus minutis rotundis distinctis lævibus subpellucidis, inferioribus oblongis pellucidis; perichætialia pauca, subduplo longiora, erecta; theca in pedunculo brevi gracili, cum ejus collo ovali oblonga, operculo conico rostrato; peristomium dentibus latis 8, ciliis brevibus angustis 8.

Hab. Ins. Ceylon, ad corticem, *Dr. Thwaites.*

Caulis 4 lineas altus. *Folia* inferiora fusca, superiora viridia, linea breviora, strictiuscula. *Pedunculus* sesquilinearis. *Theca* fusca, pro plantula satis longa. *Flos* masculus non visus.

Z. BREVICILIATUS, *Thw. et Mitt.*

Synoicus; caulis inferne fusco-tomentosus; folia a basi brevi angustiore erecta, cellulis paucis oblongis pellucidis areolata, patentia, ligulata, flexuosa, acuta, nervo infra apicem evanido carinata, margine apicem versus denticulato, cellulis parvis rotundatis obscuris minutissime papillosis; perichætialia intima brevia, lanceolata acuta, integerrima; theca longe pedunculata, ovalis, in collum sensim angustata, ore parvo, operculo subulato obliquo; peristomium simplex, internum, ciliis brevissimis 16.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis semiunciam altus. *Folia* pallide viridia, lineam longa. *Pedunculus* semiuncialis, gracilis, pallidus. *Theca* longiuscula.

This resembles ***Z. subdenticulatus***, Hampe, from the Equatorial Andes, especially in its elongate capsule.

ENTOSTHODON, *Schwægr.*

Amphoritheca, *Hampe.*

E. PLANIFOLIUS, *Thw. et Mitt.*

Monoicus, humilis; folia patula, obovata, planiuscula, acumine brevi semitorto pungente, integerrima, nervo debili supra medium evanido, margine e seriebus cellularum angustissimarum tribus in limbum angustum callosum conflatis, cellulis amplis pellucidis; theca in pedunculo recto, sporangio globoso, collo pyriformi breviore, operculo plano; peristomium nullum.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis lineam altus. *Folia* sesquilineam longa, pallide viridia, limbo dilute flavo. *Pedunculus* quadrilinearis ruber.

In its apiculate leaves this somewhat resembles *E. physcomitrioides*, Mont. (*Funaria*); but their margins are distinctly limbate, and the capsule is gymnostomous.

TAYLORIA, *Hook.*

T. IMBRICATA, *Thw. et Mitt.*

Monoica; caulis humilis, inferne radiculosus; folia imbricata, obovata, obtusa, excavata, nervo in mucronem patulum recurvumve sublævem excurrente, margine apicis denticulis paucis brevibus serrato, cellulis ovali-hexagonis areolata; perichætialia conformia; vaginula pilis paucis elongatis exsertis hirta; pedunculus crassus, pallidus; theca cylindracea, operculo convexo acuminato; peristomii dentes carnosuli, 8. Calyptra tenuimembranacea, nitida, pilis elongatis divaricatis dependentibusque hirsuta.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Folia lineam longa, pallide luteo-viridia.

LEPTOSTOMUM, *Brown, Trans. Linn. Soc.* x. 130.

L. DENSUM, *Thw. et Mitt.*

Caules in cæspitem densum radicellis rufis intertextum congesti; folia patentia, sicca appressa subcontorta, oblonga, obtusissima, nervo in pilum lævem excurrente carinata, margine recurvo integerrimo, cellulis rotundis densis; perichætialia conformia, pilo longiore flexuoso, apice minute denticulato; theca in pedunculo elongato flavo, oblongo-ovalis, erecta, operculo obtuso subhemisphærico.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis unciam altus. *Folia* inferiora radicellis obvelata, pallide fusca, superiora innovationum viridia. *Pedunculus* uncialis. *Theca* sesquilinearis.

DREPANOPHYLLUM, *Rich.*, *Hook. Musc. Exot.* 145.

D. OPPOSITIFOLIUM, *Thw. et Mitt.*

Caulis procumbens, gracilis, viridis, dein fuscescens, innovationibus paucis e latere oriundis, apicem versus foliis magnitudine decrescentibus minusque asymmetricis ramosus, radicellis brevibus rubris corpusculisque tubulosis haustellariiformibus fuscis ex axillis foliorum egredientibus sparsim vestitus; folia opposita, plana, ambitu suboblongo-ovata, inæquilatera, margine superiore arcuato, limbo e cellulis angustis pluribus conflato, apice tantum denticulis paucis eroso ibique evanescenter marginato, margine inferiore recto subsinuatove, limbo obsoleto, apicem versus crenulato, nervo ad marginem inferiorem propinquo, apice in mucronem ad caulis apicem spectantem excurrente, cellulis parvis rotundis pellucidis, interstitiis crassis obscuris, areolata.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis circiter semiuncialis, latitudine cum foliis lineari. *Folia* pallide viridia absque nitore.

Erpodium, *Brid.*

Euerpodium, *Mitt. Musc. Austr. Amer.* 403.

E. ceylonicum, *Thw. et Mitt.*

Monoicum; caulis ramis irregularibus subpinnatim ramosus, prostratus; folia complanata, superiora (=dorsalia) imbricata, directione divergentia, oblongo-orbiculata, basi ad insertionem angusta asymmetrica, margine superiore arcuato, inferiore rectiusculo, integerrima, obtusissima, cellulis parvis rotundis obscuris areolata, inferiora (=ventralia) multo minora, directione patentia, oblonga, obtusa, symmetrica; perichætium foliis imbricatis erectis convolutaceis, apicibus obtusis parum recurvis, internis ovalibus margine papillis minutis eroso; theca in pedunculo brevi pallido, ovali-oblonga, operculo conico acumine obliquo; calyptra infra medium thecæ descendens, basi truncata, uno latere breviter fissa, superne tumida subscabra in apiculum brevem producta; flos masculus triphyllus, foliis ovatis obtusis.

Hab. Ceylon, ad corticem, *Dr. Thwaites.*

Rami cum *foliis* vix tertiam quartamve partem lineæ lati. *Folia* intense viridia. *Ramus* fructifer cum capsula completa quam linea brevior. *Pedunculus* theca parum brevior, pallidissimus.

Compared with *E. domingense*, Brid., Schwægr. Supp. t. 267 (*Anœctangium*), the following differences present themselves:—In *E. domingense* the leaves are compressed and rather densely inserted; those on the underside of the branches not obviously distinct or different in form from those of the upper, which are of an oblong-ovate outline, their apices obtuse, their base being slightly asymmetric, from one margin being more rounded than the other. In *E. ceylonicum* the upper or dorsal leaves, almost orbicular in outline, are distinctly bifarious and so inserted that each one slightly overlaps the inferior edge of the one next above it, completely covering the leaves inserted on the ventral side, which are of considerably less than half the size of the dorsal ones, so that the branches viewed with a lens on the dorsal side may be very easily overlooked as belonging to some species of *Lejeunia* allied to the common *L. serpyllifolia.*

Stephanostoma. *Folia compressa, subdistiche imbricata. Fructus ex apicibus ramorum oriundus. Theca sessilis, exserta, ore demum plicis inflexis, cornuta.*

E. Bellii, *Mitt.*

Monoicum; caulis, repens, ramosus; folia compressa, imbricata, patentia, dorsalia orbiculari-ovalia breviter acuminata, ventralia late ovali-ovata acuta, cellulis parvis rotundis obscuris areolata; ramus fructifer elongatus, foliis inter se remotiusculis ovatis acutis, superioribus patentibus; theca in pedunculo brevissimo fere sessilis, oblonga, cylindracea, pallide albo-fusca, chartacea, operculo convexo rostellato clausa, lævis, post operculi delapsum autem ore pallide fusco, plicis quatuor inflexis clauso et brevissime quadricornuto, infra os omnino lævis, inferne magis ventricosa; calyptra conica acuta, basi infra os thecæ paululum descendente, brevissime plurifida, uno latere autem profundius fissa; flos masculus parvus, e foliis tribus ovatis obtusis compositus.

Hab. India orientalis, ad corticem, *Bell.*

The appearance of the specimens seems to denote that they have grown in a situation liable to inundation, or that the species is riparian in its habitats.

This very curious moss creeps over bark in a prostrate manner; its foliage is of a dull green colour, and when dry is loosely appressed to the stem and erecto-patent; when wet it resembles the species of *Erpodium* and *Aulacopilum* so closely that there would be no hesitation in placing it with them; the fruit, however, differs considerably, and comes nearer to *Leptocalpe*, yet differing greatly in the calyptra; the capsule is large, and, after the fall of the operculum, becomes almost colourless, excepting the plicate mouth, which is pale straw-colour.

AULACOPILUM, *Wils.*

A. tumidulum, *Thw. et Mitt.*

Monoicum; folia compressa, superiora (=dorsalia) divergentia ovato-lanceolata asymmetrica, basi obliqua, margine superiore arcuato, inferiore rectiusculo, inferne parum incurva, apice cellula unica elongata apiculato, cellulis parvis rotundis obscuris minute papillosis areolata; ventralia minora, directione patentia, lanceolata; perichætialia interna, erecta, convolutacea, ovalia, subacuminate acuta; pedunculus brevis, pallidus; theca oblonga, ore satis magno, operculo conico acuminato; calyptra tumida, lobis elongatis appressis, apice acuto subscabro.

Hab. Ins. Ceylon, ad corticem, *Dr. Thwaites.*

Habitu statura adspectuque *A. glauco*, Wils., simile, foliis autem densius insertis, dorsalibus apicibus latioribus minus acuminatis.

A. ABBREVIATUM, *Mitt.*

Monoicum; folia compressa, dorsalia imbricata, directione patula, oblongo-ovalia, symmetrica, obtusiuscule acuta, ventralia angustiora directione vix diversa, apicem versus latiuscula, lanceolata acuta, cellulis parvis rotundis obscuris areolata, papillis minutis ubique erosa; perichætialia convolutacea, ovalia acuta; theca in pedunculo brevi pallido, brevis, poculiformis, operculo breviter conico acuminato; calyptra lobis breviusculis appressis, apice acuto subscabro; flos masculus gemmiformis.

Hab. India orient. ad caudices tomentosos filicis cujusdam repens, *W. Bell.*

A. glauco A. tumiduloque statura simillimum, foliis autem dorsalibus apices versus latis obtusiusculis, angulo obtuso terminatis, et theca et calyptra brevioribus.

A. INCANUM, *Mitt.*

Monoicum, pinnatim ramosum; folia compressa, dorsalia patentia ovata apice in acumen angustum diaphanum producta, ventralia dimidio minora ovato-lanceolata, cellulis rotundatis obscuris, papillis minutis; perichætialia erecta, interna, convolutacea, ovata subacuminata; theca in pedunculo pallido subæquilongo, ovalis, operculo breviter conico-acuminato; calyptra ad perichætium usque descendens, apice subscabra; flos masculus gemmiformis, foliis acutis.

Hab. Africa australis, East London, ad corticem, *beatus Rooper.*

This closely resembles *A. glaucum*, but has the points of its leaves diaphanous.

Erpodium Beccarii, C. Muller, Venturi in Nuovo Giornale Botanico Italiano, fasc. i. p. 18, is clearly, from its description, an *Aulacopilum*, and is stated to have leaves with an elongate hyaline hair-point, by which it much differs from *A. incanum.*

ANOMODON, *Hook.*

A. FILIFORMIS, *Thw. et Mitt.*

Caulis procumbens, ramis ramosis subpinnatus; folia caulina erecto-patentia, undique disposita, basi subovata, acumine lato ligulato obtuso, nervo tenui medio evanescente, ramea compressa patula ovato-oblonga obtusa, nervo supra medium evanido, ob prominentiam papillarum margine crenulato, cellulis parvis rotundis papillosis obscuris.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis unciam longus; rami bilineares. *Folia* intense viridia subglauca.

This appears to be a species less than *A. tristis*, Cesati; and, so far as can be seen by the specimens yet examined, the habit seems more depressed.

A. HUTTONII, *Mitt.*

Caulis procumbens, ramis ascendentibus subpinnatim divisus; folia caulina patentia, ovata, acumine lato apice acutiusculo, nervo indistincto supra medium evanido, ramea subcompressa, basi subovata, ligulata, acutiuscula, omnia inferne canaliculato-concava, apicem versus plana, cellulis rotundis obscuris papillosis areolata, margineque crenulata.

Hab. New Zealand, Great Barrier Island, *Hutton et Kirk.*

Similar to *A. tristis*, Cesati, in stature, but more depressed and forming matted tufts.

A. EXILIS, *Mitt.*

Caulis procumbens, ramis irregularibus subpinnatim ramosus; folia compressa, caulina basi ovata ligulata obtusiuscula, rameaque patentia conformia vel basi minus ovata magis compressa, inferne canaliculato-concava, apice plana obtusissima, cellulis rotundis obscuris minutissime papillosis areolata, nervo indistincto supra medium evanido.

Hab. Africa australis, Natal, *Attercliffe, J. Sanderson.*

A. Huttoni minor, foliis rameis obtusioribus magis compressis.

CYATHOPHORUM, *Brid.*

C. SUBLIMBATUM, *Thw. et Mitt.*

Caules apice sæpe attenuati, foliis magnitudine decrescentibus, simplices; folia lateralia divergentia, ovalia acuminata, margine a medio ad apicem usque denticulis angustis serrata, limbo obsoleto, nervo ad tertiam folii longitudinis partem producto simplici furcatove; folia stipuliformia late ovalia acuminata, enervia, margine superne denticulata.

Hab. Ins. Ceylon, *Dr. Thwaites.*

C. Hookeri statura adspectuque simile, foliis autem limbo indistincto cellulisque paululum majoribus et foliis stipuliformibus enervibus denticulatis diversum.

HYPOPTERYGIUM, *Brid.*

Euhypopterygium, *Mitt. Musc. Aust. Amer.*

H. APICULATUM, *Thw. et Mitt.*

Dioicum; folia in ramorum primariorum medio latissime oblongo-ovata, in acumen breve producta, nervo infra apicem evanido, limbo superne denticulato circumdata, cellulis parvis rotundis obscuriusculis; folia stipuliformia orbiculata, nervo in acumen angustum excurrente, integerrima; perichætialia late ovata, nervo excurrente acuminata; theca in pedunculo elongato, oblonga, horizontalis, operculo longirostri.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Stipes semiuncialis, in frondem circiter semiunciam longam apice divisus. *Folia* pallide glauco-viridia, sicca deflexa. *Pedunculus* semiunciam longus.

H. aristato, Bryol. Javan. t. 141, valde similis; folia autem cellulis fere dimidio minoribus areolata.

HOOKERIA, *Sm. Trans. Linn. Soc.* ix. 275.

Cyclodictyon, *Mitt. Journ. Linn. Soc.* viii. 163.

H. CEYLANICA, *Thw. et Mitt.*

Monoica synoicaque; caulis ramosus; folia compressa, media late ovalia, intermedia oblongo-ovalia, lateralia angustiora, uno latere a medio ad basin usque inflexo, omnia obtusa, apiculo brevi terminata, marginibus limbo angusto e duplici serie cellularum composito circumdata, apice serrulata, nervis ad $\frac{3}{4}$ folii longitudinis productis, dorso apicem versus denticulatis, cellulis hexagonis pellucidis; perichætialia parva, lanceolata; theca in pedunculo elongato, ovalis, horizontalis decurvave, collo vix ullo distincto, operculo conico acuto; peristomium dentibus lamina externa per lineam mediam divisa, internum processibus dentium longitudine, in membrana ad $\frac{1}{4}$ ejus longitudinis exserta impositis.

Hab. Ins. Ceylon, rarissima, *Dr. Thwaites.*

Caulis pallidus, depresse cæspitosus, cum foliis lineam latus. *Folia* pallide viridia. *Pedunculus* uncialis, ruber.

H. blumeano similis, foliis autem denticulatis.

LEPIDOPILUM, *Brid.* ii. 267.

Eulepidopilum, *Mitt. Musc. Austr. Amer.* 267.

L. FURCATUM, *Thw. et Mitt.*

Monoicum; caulis dichotome divisus; folia compressa, nitida, media ovalia acuminata, intermedia ovali-lanceolata parum acuminata, lateralia divergentia elliptico-lanceolata uno latere inferne inflexo, omnia medio tenus binervia, margine apicem versus serrulato, limbo angusto e duplici serie cellularum angustarum composito circumdata, cellulis oblongis areolata; perichætialia parva, lanceolata; theca in pedunculo duplo longiore, erecta, ovalis, evacuata infra os siccitate valde constricta; peristomii dentes e stratis laminæ externæ divisis, internæ processus æquilongi angusti in membrana usque ad $\frac{1}{3}$ dentium longitudinis exserta impositi; calyptra pilis paucis inspersa.

Hab. Ins. Ceylon. *Dr. Thwaites.*

Caulis biuncialis, latitudine cum foliis vix bilinearis. *Folia* superiora viridia, seniora fuscescentia interdum purpurascentia. *Pedunculus* subbilinearis, lævis.

DISTICHOPHYLLUM, *Dozy et Molk. Musc. Archip. Ind.* 99.

Mniadelphus, *C. Muller*.

D. LIMPIDUM, *Thw. et Mitt.*

Caulis elongatus, subsimplex, flaccidus; folia compressa, media late ovali-oblonga, in apiculum brevem acuminata, intermedia patentia lateraliaque patula longiora cæteroquin conformia, planiuscula, mollia, margine parum undulata, angustissime limbata, integerrima, cellulis rotundo-hexagonis limpidis limitibus angustis areolata, nervo angusto sub apice evanido.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis biuncialis, fuscescens, cum foliis 2½ lineas latus. *Folia* tenera pallide glauco-viridia, seniora pallide fusca, siccitate corrugata.

Cells of the leaves towards the apex and margin twice as large as in *D. succulentum*, Mitt. Musc. Ind.; and partly from this cause, although the outline of the leaf is nearly the same, the present species appears more pellucid.

D. MUCRONATUM, *Thw. et Mitt.*

Synoicum; caulis breviusculus; folia superiora pallide viridia, seniora fusca compressa, omnia fere conformia, elongate oblonga, lateralia patentia basi parum angustiora oblonga subspathulata obtusa cum apiculo elongato angusto pungente, margine flexuoso limbo angusto circumcincto integerrima, nervo usque ad ¾ folii longitudinis producto, cellulis parvis rotundis; perichætialia minuta, ovalia acuta acuminatave; theca in pedunculo breviusculo rubro gracillimo, ovalis, horizontalis, collo sensim attenuato; peristomium dentibus lamina externa per lineam mediam divisa, internum æquilongum processibus in membrana usque ad ⅓ ejus longitudinis exserta impositis.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis subsemiuncialis, cum foliis 2 lineas latus. *Folia* siccitate marginibus flexuosis. *Pedunculus* bilinearis.

Larger than *D. cuspidatum*, Dozy et Molk. Musc. Archip. Ind. t. 33; leaves more oblong, less spathulate, and with longer nerves.

ERIOPUS, *Brid.*

E. LUCIDUS, *Thw. et Mitt.*

Caulis gracilis, inferne nigro-fuscus, simplex vel superne divisus; folia, apicem versus caulis minora, compressa, plana, media intermediaque late ovalia, lateralia ovalia subduplo majora, omnia apiculo brevi terminata, nervis inæqualibus brevibus inconspicuis, limbo angusto e duplici serie cellularum angustarum composito marginata, superne denticulis parvis spinuloso-serrata, cellulis ovalibus hexagonis post resorptionem chlorophylli parietibus angustis areolata; perichætialia ovato-lanceolata acuminata, immarginata, subserrata; theca in pedunculo brevi ubique setulis brevibus obtecto, breviter ovalis collo attenuato, horizontalis, operculo conico tenuirostri; peristomium dentibus lamina exteriore per lineam mediam divisa, latioribus, internum æquilongum, processibus in membrana usque ad $\frac{1}{3}$ dentium longitudinis exserta impositis; calyptra pilis hyalinis obtecta basique fimbriata.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis unciam altus, cum foliis lineas duas latus. *Folia* pallide viridia, sicca scariosa nitida, cellulis sub lente iridicoloribus. *Pedunculus* bilinearis, pallidus, setulis ad flexuram, ubi in collum thecæ transit, parum longioribus surrectis.

Smaller than *E. remotifolius*, C. Muller, Bryol. Javan. t. 157 but the peduncle less setulose.

GAROVAGLIA, *Endl.*

G. DENSIFOLIA, *Thw. et Mitt.*

Caules dense congesti, rigidi, crassi, teretes; folia dense inserta, imbricata, oblonga, infra medium parum latiora, apice obtusa cum apiculo brevi recurvo, concava, plicis 2–4 lævibus exarata, haud excavata, brevissime fere obsolete binervia, margine basis late implana, apicem versus minute serrulata, cellulis oblongis oblique seriatis, alaribus parvis quadratis flavis areolata; perichætia exserta, obconica, foliis orbiculari-obovatis vaginantibus, apicibus acuminatis patentibus integerrimis; theca oblonga, immersa, operculo acuminato parum obliquo, peristomium infra thecæ os impositum, dentibus parvis horizontalibus inflexisve rubris teneris cohærentibus liberisve.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis 1–3 uncias altus, cum foliis 2 lineas crassus. *Folia* superiora straminea, inferiora fuscescentia, perichætialia supra orificium thecæ cupulatim expansa.

This agrees with *G. plicata* (Nees ab E.) in its immersed capsule, but is immediately distinguished by its wide, short, pointed leaves.

From *G. aristata,* V. d. Bosch et Lac. Bryol. Javan. t. 185, it differs in the more nearly oblong form of its leaves, and also in the form of those belonging to the perichætium.

The following sketch of the species certainly known to belong to the genus *Garovaglia* will show the positions assignable to the additions here proposed:—

A. Theca immersa.

* Peristomium incompletum.

plicata (Nees).
Powellii, Mitt.
aristata, V. d. Bosch et Lac.
lævifolia, sp. nov.
obtusifolia, sp. nov.
densifolia, sp. nov.
tortifolia, sp. nov.

** Peristomium duplex, completum.

setigera (Sull.).
cuspidata, Mitt.

B. Theca exserta.

elegans, Dozy et Molk.
moluccensis, V. d. Bosch et Lac.
samoana, Mitt.
angustifolia, Mitt.
compressa, sp. nov.
carinata, sp. nov.

Some other species have been described by C. Müller as having been found in Ceylon by Nietner; but, from the descriptions, they must be different in habit, for they are stated to have creeping stems, a character observable in none of the species above tabulated, in all which the habit appears to be as in *Orthotrichum*.

G. OBTUSIFOLIA, *Thw. et Mitt.*

Caulis basi divisus; folia dense inserta, imbricata, patentia, latissime ovalia obtusissima, cum mucrone minuto inflexo reflexove, sub apice excavata, circiter quadriplicata, plicis dorso lævibus, breviter binervia, margine integerrimo minutissimeve serrulato, cellulis densiusculis areolata; perichætialia erecta, latissime ovalia, cuspide brevi patente; theca emergens, ovato-oblonga, sicca sub ore contracta; peristomium depressum, dentibus carnosis rubris cohærentibus siccitate involutis, internum æquilongum processibus subcarnosis angustis flavis liberis.

Hab. Ins. Ceylon, *Dr. Thwaites.*

G. densifoliæ simillima, foliis autem sub apice profundius concavis, apiculo inconspicuo et perichætio peristomioque diversa.

G. LÆVIFOLIA, *Thw. et Mitt.*

Dense cæspitosa; caulis subsimplex; folia dense inserta, tereti- et tumidi-imbricata, oblongo-ovalia, apice excavata, cochleariformi-concava, lævia, apiculo subplano brevi recurvo, margine apicem versus serrulato, enervia, cellulis oblique seriatis areolata; theca oblonga, in perichætium foliis erectis lanceolatis integerrimis convolutis immersa, operculi rostro brevi obliquo; peristomium depressum, dentibus brevibus cohærentibus, vestigiis tenerrimis processus adhærentibus.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Crassitudine caulium *G. plicatæ* similis, primo visu tamen ex omnibus speciebus hucusque descriptis foliis haud plicatis distincta.

G. TORTIFOLIA, *Mitt.*

Caulis curvatus, ruber, inter folia conspicuus; folia subcompressa, divergentia, semitorta, ovali-elliptica, sensim in acumen longiusculum angustum læve producta, plicis tribus dorso lævibus exarata, parum excavata, margine late implano, superne denticulis angustis serrato, a medio ad basin usque revoluto, breviter binervia, cellulis angustis areolata; perichætialia late ovalia, sensim acuminata, acumine erecto, inferne denticulis paucis remotis inconspicuis serrata, apice integra; theca immersa, cylindracea, operculo acuminato obliquo.

Hab. Ins. Borneo, Sarawak, *Everett.*

G. eleganti quoad formam foliorum similis, directione autem eorum divaricata et theca immersa statim dignoscitur.

G. COMPRESSA, *Mitt.*

Caulis elongatus, curvatus; folia compressa, patentia patulave, stricta, elongate lanceolata, apice latiuscule acuta, basi parum latiora, plicis tribus statu sicco distinctioribus exarata, planiuscula, enervia, margine apicem versus denticulato, cellulis angustis areolata; perichætialia parva, late ovalia, acumen versus breviter denticulata; theca in pedunculo æquilongo, cylindracea, operculo oblique rostrato.

Hab. Ins. Borneo, Sarawak, *Everett.*

More slender than *G. angustifolia*, and with narrower leaves, which are not acuminate. Unlike any other species in its narrow, flat, compressed leaves.

G. CARINATA, *Mitt.*

Caulis inferne decumbens, rarius divisus; folia patentia, interdum subsecunda, ovata, vel ob margines basi reflexos latissime lanceolato-ovata, in acumen pungens dentatum sensim producta, concava, infra acumen parum excavata, tri- quadriplicata, breviter binervia, dorso denticulis paucis scabriuscula, margine denticulis serrato, cellulis parvis angustis oblique seriatis areolata; perichætialia parva, erecta, ovata, apice dentato-lobata subintegrave acuta, convoluta; theca in pedunculo breviore, subcurvata, oblongo-cylindracea; peristomium depressum, dentibus subhorizontalibus apicibus incurvis inferne cohærentibus rubris.

Hab. Bootan (*herb. Griffith*).

A robust species, with leaves less densely inserted than they are in *G. plicata* and less spreading than in *G. elegans*; there are present on the back of the leaf a few scattered teeth of the

same kind as those so prominent on the folds of the leaves of *G. plicata*. From the figure in 'Bryologia Javanica,' t. 195, *G. aristata* in size and appearance resembles *G. carinata*; but the fructification is as represented in the same work, t. 196 (*G. moluccensis*).

The internal peristome, as seen in old capsules, appears to exist only in a rudimentary state, and is perhaps adherent to the teeth.

PTEROBRYUM, *Hornsch.*

P. INVOLUTUM, *Thw. et Mitt.*

Rami inferne nudi, superne in frondem subpinnatim ramosam divisi; foliis patentibus ovali-oblongis brevi-apiculatis marginibus incurvis conniventibus integerrimis, nervo angusto infra apicem evanido, cellulis angustis, basalibus ad angulos densioribus aurantiacis areolatis; perichætia e ramo primario vel e ramulorum latere oriunda, foliis longioribus convolutaceis erectis subulato-angustatis integerrimis; theca in pedunculo brevi cylindracea, operculo conico-rostrato; peristomium breve, depressum, dentibus teneris pallidis, annulo lato cinctis; calyptra dimidiata.

Hab. Ins. Ceylon, prov. central., alt 4000'–6000', *Dr. Thwaites.*

Rami fertiles biunciales, steriles elongati ramulis nonnullis filiformi-attenuatis. *Folia* lineam longa, stramineo-viridia, interdum fulvescentia, subnitida; sicca immutata. *Pedunculus* bilinearis, fuscus. *Theca* fusca, pedunculo longitudine æqualis.

This species, in habit and appearance, closely resembles *P. convolutum* (Dozy et Molk.), 'Musc. Archip. Ind.' t. 50 (*Symphysodon*), and *P. cylindraceum* (Mont.), but is a little more robust; the foliage, in the incurvation of the margins of the leaves, resembles that of the first-named moss. The exserted capsule and dimidiate calyptra, so different from those of species otherwise closely related, may suffice for the placing of this species in a different section, which appears to be the most natural way of disposing of such differences. Many similar instances are presented amongst the mosses referred to the genus *Neckera*, the capsule being immersed in the perichætial leaves with a short calyptra, or exserted and having a longer calyptra decidedly split on one side.

P. CEYLANICUM, *Thw. et Mitt.*

Rami elongati, curvati, simplices vel parum divisi, ramulos angustos stoloniformes hic illic emittentes; folia patentia divergentiave, densiuscula, sed laxe imbricata, late ovalia obtusa et mucrone angusto subulato, excavata, valde concava, margine basi inflexo caulem amplexante,

apicem versus incurvo, integerrima, nervis binis basi conflatis, cellulis angustissimis, basalibus nullis diversiformibus areolata; perichætialia erecta, exteriora brevia, interiora elongate oblonga concava, versus acumen subulatum parum excavata, ad thecam oblongo-ovatam brevipedunculatam emergentem appressa; peristomium et humidum et siccum in conum acutum prominens e dentibus angustis firmis dorso articulationibus prominentibus denticulato-asperis pallide fuscis compositum.—Meteorium crassicaule, *Mitt. Musci Ind. Or.*

Hab. Ins. Ceylon, Rambodde: *Gardner*, no. 9; *Thwaites*, no. 181.

This fine species in size and appearance very nearly resembles the *Meteorium crassicaule* (C. Müller), Bryol. Jav. t. 210, but differs in its more elongated branches, which produce but few flagelliform shoots. The leaves in all the specimens are of a rich glossy brown colour, except towards the apices of the stems, where they are straw-coloured and less glossy; they are destitute of any longitudinal folds. The *Meteorium flexipes*, Mitt. Musc. Ind. Or., in foliage and appearance nearly resembles *P. ceylanicum*; but its capsule is exserted. All these species present characters which are rather those of *Pterobryum* than of *Meteorium*; for they are not species having a pendulous habit.

METEORIUM, *Brid.* ii. 264.

M. ATTENUATUM, *Thw. et Mitt.*

Rami elongati, graciles, ramulis divergentibus irregulariter pinnatim ramosi; folia patentia divergentiaque, ovato-lanceolata, sensim angustissime attenuata, ramulina angustiora, tenuiter capillari-attenuata, omnia basi cordata, alis inflexis, marginibus minute serrulatis, acumine lævi, nervo tenui medio evanescente, cellulis angustis papilla unica dorso prominula punctulatis.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Rami semipedales, ramulis semiuncialibus ramosi. *Folia* seniora nigricantia, juniora stramineo-viridia, nitida, sicca parum mutata.

M. RUFIFOLIUM, *Thw. et Mitt.*

Monoicum! caulis pendulus, ramis dissitis divaricatis; folia ramea appressa vel cum ramulinis patula subcompressa, ovato-lanceolata sensim angustata, apice anguste acuta, basi uno latere inflexa, planiuscula, nervo tenui supra medium evanido, margine ubique serrulato, cellulis angustissimis elongatis, papillis singulis minutis dorso prominulis; perichætialia parva, conformia, erecta; theca in pedunculo brevi lævi, ovalis, operculo subulato obliquo; peristomium internum processibus angustis cum dentibus subæquilongis, in membrana brevi exserta impositis; calyptra parva, basi plurifida, sed uno latere profundius fissa.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Rami semipedales, graciles, ramulis semiuncialibus. *Folia* sesquilineam longa, flavo-fulvescentia subnitida, sicca directione immutata. *Pedunculus* lineam longus.

In appearance similar to *M. aureum*, Griff., but with shining leaves, singular in its inflorescence.

M. ENERVE, *Thw. et Mitt.*

Rami elongati, penduli, ramulis divaricatis pinnati; folia ramea appressa, imbricata, late ovata, apice in subulam elongatam angustam producta, integerrima, enervia, cellulis angustissimis lævibus, ad angulos basalibus paucis latioribus suboblongis concoloribus areolata; ramulina patentia oblonga obtusa, in acumen subulatum angustum elongata, margine superiore acumineque subserrulata, canaliculato-concava, enervia, cellulis superioribus papillis singulis difficillime definiendis punctata.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Rami pedales, ramulis uncialibus vel brevioribus. *Folia* lineam longa, ramea cauli appressa, ramulina plumose patentia; juniora viridia, deinde fulvo-fuscescentia.

CHÆTOMITRIUM, *Dozy et Molk.*

C. CONFERTUM, *Thw. et Mitt.*

Dense cæspitosum; rami ascendentes, ramosi; folia late oblonga, integerrima, basi subcordata, apice subito in acumen subulatum denticulatum contracta, brevissime binervia, ramea patula imbricata ovato-lanceolata acuta subacuminatave excavata margine apiceque implana serrulata enervia, cellulis angustis elongatis areolata; perichætialia plura, caulinis majora, subconformia, apice integra lacerave, marginibus ciliato-dentatis; theca in pedunculo rubro breviusculo basi lævi superne brevissime setuloso-aspero inclinata, ovali-oblonga, ore obliquo, operculo curvirostro, peristomii dentibus latis, interni æquilongi processibus latiusculis in membrana usque ad $\frac{1}{3}$ ejus longitudinis exserta impositis; calyptra setulis aspera, basi lacera.

Hab. Ins. Ceylon, *Dr. Thwaites.*

C. *venusto,* Reinw. et Nees (*Hypnum*), simillimum.

MACROHYMENIUM, *C. Müller.*

M. LÆVE, *Thw. et Mitt.*

Monoicum; rami breves; folia patentia, imbricata, elliptico-lanceolata, concava, margine anguste plana, integerrima, cellulis oblongis oblique seriatis, alaribus pluribus limitibus incrassatis aurantiacis; perichætialia erecto-patentia, majora, magis acuminata; pedunculus ruber, lævis, ubi in thecæ erectæ ovalis collum transit subscaber; operculum conicum, rostro subulato; peristomium dentibus brevibus supra medium subulatis, internum processibus quam dentes duplo longioribus, in membrana brevissima insidentibus.

Hab. Ins. Ceylon, *Dr. Thwaites.*

M. rufo, Dozy et Molk. Musc. Archip. Ind. t. 54, similis, foliis autem longioribus.

Rhegmatodon Nietneri, C. Mueller, Linn. Band xxxvi. p. 20, which must also be included in the genus *Macrohymenium*, is described with a capsule " undique asperula," and must therefore be sufficiently distinct.

SEMATOPHYLLUM, *Mitt. Journ. Linn. Soc.* 1868.

Sect. Acroporium, *Mitt. l. c.*

S. PUNCTULIFERUM, *Thw. et Mitt.*

Dioicum; caulis procumbens, ramis assurgentibus laxius confertis; folia laxe inserta, patentia, recta, apicalia in gemmam teretem angustam elongatam convoluta, ovali-elliptica acuta, marginibus superne conniventibus tubulosa, integerrima, basi subcordata, cellulis alaribus conspicuis, superioribus angustis subconflatis dorso limitibus prominentibus; perichætialia ovata, in acumen elongatum serrulatum producta; pedunculus elongatus, ruber, scaber; theca ovalis, horizontalis; peristomium dentibus latis, lamina interna quam externis angustiore, internum processibus, ciliis brevioribus interpositis, in membrana ad $\frac{1}{3}$ dentium longitudinis exserta insidentibus.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Folia semilineam parum excedentia. *Pedunculus* sexlinearis.

Sect. Rhaphidorrhynchum, *Schimp.*

S. CAPILLIFERUM, *Thw. et Mitt.*

Dioicum? caulis procumbens, ramis assurgentibus; folia laxe et teretiuscule imbricata, patentia, ovalia, basi constricta, apice in acumen angustum rectum subulato-attenuata, integerrima, excavata, margine superne subplana, cellulis angustis alaribus distinctis areolata, subulata, integerrima; pedunculus elongatus, lævis; theca ovalis, horizontalis, operculo subulirostro; peristomii interni processus ciliis singulis interpositis in membrana usque ad $\frac{1}{3}$ ejus longitudinis exserta impositi.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Rami sesquilineam crassi. *Folia* lineam longa, tenera, nitida, lævia. *Pedunculus* semiuncialis. *Theca* parva.

S. cirrhifolio, Schwægr., statura similis, folia autem haud compressa, integerrima.

S. MONOSTICTUM, *Thw. et Mitt.*

Monoicum, pusillum, cæspitosum; folia compressa, lateralia divergentia, apicibus decurvatis subsecundis, ovali-lanceolata subulato-acuminata, concava, basi constricta, margine erecto superne subflexuoso serrulata, cellulis elongatis apicibus in papillas exstantibus perspicuis, alaribus distinctis fuscis areolata; perichætialia longiora, conspicue serrata; pedunculus ruber, versus collum thecæ ovalis pendulæ scaber; operculum longissime subulatum; peristomium dentibus latis, lamina interna quam externa angustiore, internum æquilongum processibus cilii nullis in membrana ad dentium dimidiam longitudinem exserta impositis.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Rami cum foliis lineam lati. *Folia* viridia, fuscescentia. *Pedunculus* trilinearis, apicem versus arcuatus. *Theca* minuta.

S. RUFICAULE, *Thw. et Mitt.*

Dioicum; caulis procumbens, ramis assurgentibus rufis; folia subcompressa, laxe disposita, patula, recta, lanceolata subulato-angustata, apice autem latiusculo, concava, margine tenuiter sed argute serrulato, cellulis superioribus elongatis apicibus in papillas grossiusculam exstantibus, basin versus lævioribus, alaribus majusculis oblongis externis hyalinis areolata; perichætialia erecta, longiora, argutius serrata, subplicata; pedunculus validus, ruber; theca ovalis, inclinata, operculo conico subulirostri; peristomii dentibus validis intus lamelliferis, processibus in membrana usque ad ⅓ dentium longitudinis exserta impositis.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis 1–1½ unciam longus, gracillimus. *Folia* semilineam parum excedentia, plumose disposita, glauco-pallido-viridia. *Pedunculus* 4–5 lineas longus.

S. ASPERIFOLIUM, *Thw. et Mitt.*

Dioicum? caulis procumbens, ramis ascendentibus laxifoliis; folia patentia, stricta, sicca directione immutata, apicalia erecta appressa, anguste elongate lanceolata, sensim angustata, parum concava, margine apiceque implana, subintegerrima vel apice denticulis inconspicuis, cellulis obscuriusculis oblique seriatis, omnibus finitibus prominentibus dorso scabris, cellulis alaribus externis oblongis conspicuis hyalinis; perichætialia e basi subovata superne lobato-dentata, in acumen loriforme producta, marginibus argute denticulatis; theca in pedunculo breviusculo superne scabro, ovalis, inclinata, subhorizontalis, operculo subulato; peristomii dentes lati, lamina interna multo angustiore, interni processibus ciliis nullis in membrana ad ¼ dentium longitudinis exserta impositis.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Rami bilineares, rufi. *Folia* lineam longa, flavo-viridia, nitoris destituta. *Pedunculus* 4-linearis.

S. RAMULINUM, *Thw. et Mitt.*

Dioicum? cæspitulosum, ramis subpinnatim divisis; folia subcompressa imbricata, inferiora oblonga, apice in acumen angustum producta, superiora et ramulina obtusiuscula, apiculo brevi latiusculo, basi sæpe subsaccata, infra apicem excavata apice margineque plano subintegerrimo, cellulis angustis elongatis apicibus elevatis, præcipue ad dorsum partis excavatæ prominulis, basalibus flavis, alaribus distinctis hyalinis; perichætialia longiora, erecta, lanceolata acuminata, flexuosa, margine plana, superne serrulata; pedunculus superne papulosus; theca ovalis, horizontalis deflexave, operculo subulirostri; peristomium internum processibus apice tenuissime capillari-attenuatis quam dentes longioribus ciliisque singulis in membrana usque ad mediam dentium longitudinem exserta impositis.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Rami 3–4 lineas longi, rubri, cum foliis lineam lati. *Folia* pallide viridia, subnitida. *Pedunculus* 4–5 lineas longus, ruber.

T. fequendamensi (Hampe), Musc. Aust. Amer., simile, sed caulibus longioribus crassioribusque, statura *Chionostomo rostrato* (Griff.) similis.

LEUCOMIUM, *Mitt. Journ. Linn. Soc.* 1868.

L. LIMPIDUM, *Thw. et Mitt.*

Synoicum; caulis debilis; folia compressa, subdecurva, lateralia patentia ovato-lanceolata subacuminata integerrima, cellulis angustis limpidis areolata; perichætialia parva, latiora, subito acuminata, subdenticulata; theca in pedunculo rubro, ovalis, horizontalis, operculo rostrato; peristomium dentibus laminis externis per lineam mediam divisis, internum æquilongum, processibus in membrana usque ad $\frac{1}{3}$ ejus longitudinis exserta impositis.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis semiuncialis, cum foliis sesquilineam latus. *Folia* pallide viridia, sicca vix mutata. *Pedunculus* semiuncialis.

ECTROPOTHECIUM, *Mitt. in Journ. Linn. Soc.* 1868.

E. LÆVIGATUM, *Thw. et Mitt.*

Monoicum, depresse cæspitosum; caulis ramis approximatis, pinnatus; folia compressa, complanata, lateralia patentia subacuminata, media intermediaque ovali-elliptica acuta, margine serrulata, basi constricta, cellulis alaribus parvis inconspicuis, reliquis angustis lævibus; perichætialia erecta, ovato-oblonga, subulato-angustata, serrulata; theca in pedunculo ruberrimo, parva, ovalis, inæqualis, operculo rostro brevi subcurvulo; peristomium normale.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Rami cum foliis vix lineam lati. *Folia* albo-viridia, subnitida, siccitate parum mutata. *Pedunculus* 6–7 lineas longus.

E. SUBRETUSUM, *Thw. et Mitt.*

Dioicum? caulis procumbens, pinnatus; folia complanata, lateralia patula complicata, omnia ovato-ligulata, apice oblique obtusa subretusave, brevissime binervia, margine apicem versus (ibique denticulis pluribus approximatis apicibus divisis) crebre serrata, cellulis angustissimis, superioribus apicibus in papillas aculeiformes prominentibus areolata; perichætialia erecta, ovato-lanceolata, longius binervia, serrulata; theca in pedunculo elongato lævi, horizontalis, ovalis, collo sensim attenuato, ore satis magno, serius hiante; peristomium internum processibus ciliisque in unum coalitis æquilongis, in membrana usque ad $\frac{1}{3}$ longitudinis dentium exserta insidentibus.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis circiter trilinearis. *Folia* subnitida, sicca decurva viridia. *Pedunculus* 8–9 lineas longus.

PLAGIOTHECIUM, *Schimp. Bryol. Europ.*

P. SUBGLAUCUM, *Thw. et Mitt.*

Caulis prostratus, elongatus, simplex; folia complanata, lateralia patentidivergentia, ovata, basi inæqualia, apice parum acuminata acuta, integerrima, angustissime areolata, nervis brevibus inæqualibus.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis 2 uncias longus, cum foliis sesquilineam latus. *Folia* glaucoviridia, siccitate transversim subundulata.

HYPNUM, *Dill.*

Sec. Helicodontium, *Schwægr.* iii. ii. 2.

H. APPLANATUM, *Thw. et Mitt.*

Monoicum, pusillum, depresse cæspitosum, subpinnatim ramosum; folia caulina assurgentia, ovato-lanceolata subacuminata, subserrulata, ramea compressa serrulata, nervo concolori tenui medio evanido, cellulis ad angulos abbreviatis, reliquis oblongis, omnibus obscuriusculis areolata; perichætialia erecta, ovata acuminata, enervia; theca in pedunculo breviusculo rubro, breviter ovalis; peristomium internum processibus quam dentes brevioribus, membrana basali fere nulla.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Rami cum foliis circiter semilineam lati. *Folia* viridia, obscuriuscula, sicca cauli appressa stricta. *Pedunculus* bilinearis.

MNIODENDRON, *Lindb.*

M. DELTOIDEUM, *Thw. et Mitt.*

Stipes tomentosus, foliis basi deltoideis angulis subauriculatis inde in subulam productis divaricatis, nervo percurrente dorso remote denticulato, margine basi crenato superne remote serrulatis, cellulis ad angulos latioribus, reliquis angustis areolatis.

Hab. Adam's Peak, *Gardner*. Sent also by Dr. Thwaites.

Habit and appearance entirely those of *M. divaricatum*, for which it was passed over in the Musc. Ind., but different in the base of its leaves.

M. ARISTINERVE, *Mitt.*

Stipes tomentosus, foliis divaricatis basi deltoideis inde in subulam elongatam aristiformem productis, nervo tereti longe excurrente dorso remote dentato, margine remotiuscule serrulato, cellulis ad angulos suboblongis, reliquis angustis areolatis; rami abbreviati, foliis densis basi subdeltoideo-ovatis inde subulatis argutius serrulatis; folia perichætialia e basi tenuiore ovata, longe tenereque subulata, subserrulata; theca in pedunculo elongato rubro, horizontalis decurvatave, cylindracea, pluries plicata, operculo a basi conica sensim subulato.

Hab. Ins. Borneo in acumine montis Kina-Balloo, *H. Lowe.*

Stipes subuncialis ramis semiuncialibus. *Pedunculus* sesquiuncialis.

M. comoso habitu valde simile, foliis autem aristinerviis satis diversum.

FISSIDENS, *Hedw.*

F. TERMINIFLORUS, *Thw. et Mitt.*

Dioicus, humilis; folia circiter 20-juga, elongate oblongo-lanceolata acuta, nervo concolori percursa, lamina vera ultra medium producta apice æquali, margine integerrimo, limbo nullo, cellulis minutis obscuris minutissime papillosis areolata; theca in pedunculo breviusculo crassiusculo rubro, ovalis, inclinata, suberecta, subæqualis, operculo conico acuminato; flos masculus terminalis foliorum laminis basi sinuatis vaginantibus inclusus.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis trilinearis, cum foliis lineam latus. *Folia* glauco-viridia, superiora fere lineam longa, subflaccida, siccitate crispato-decurva.

F. BICOLOR, *Thw. et Mitt.*

Humilis; folia 6–12-juga, erecto-patentia, superiora conniventia incurvata ovato-oblonga acuta, nervo pellucido in apiculum breve excurrente, margine minutissime crenulato, lamina vera ultra medium producta apice subæquali, limbo hyalino a basi usque ad medium ascendente marginata, cellulis minutis opacis; pedunculus pallidus; theca ovalis, erecta.

Hab. Ins. Ceylon, ad terram, *Dr. Thwaites.*

Caulis 1–1½ lineam altus. *Folia* ⅓ lineam longa, intense viridia, nervo pellucido latiusculo. *Pedunculus* lineam longus.

F. semilimbato similis.

F. PAPILLOSUS, *Thw. et Mitt.*

Monoicus; folia circiter sexjuga oblongo-lanceolata acuta, nervo pallidiore in apice brevissime excurrente mucronata, lamina vera ad medium usque producta apice æquali, limbo pallido ubique marginata et in laminam apicalem breviter ascendente, marginibus reliquis crenulatis, cellulis parvis ob papillas valde prominentes subobscuris; pedunculus elongatus, pallidus; theca ovalis, æqualis, inclinata.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis lineam altus. *Folia* semilineam longa, intense viridia, siccitate decurva nervoque limbi marginalis laminæ veræ pallido, haud pellucido, prominente.

F. bicolori similis, sed major et substantia foliorum et nervo siccitate prominente diversus.

F. FUSCOVIRIDIS, *Thw. et Mitt.*

Caulis elongatus, ramulis brevibus ramosus; folia 10–20-juga, patentia, elongato-oblonga acuta, nervo concolori pallidiore in apice evanido, margine crenulato subserrulato, cellulis rotundis ob papillas prominulas subobscuris limitibus pellucidis, lamina vera ad medium producta apice uno latere rotundato-inæquali; pedunculus fuscus; theca ovalis, suberecta, æqualis; flos masculus in ramulo brevi terminalis.

Hab. Ins. Ceylon, ad corticem, *Dr. Thwaites.*

Caulis 2 lineas altus, cum foliis $\frac{2}{3}$ lineam latus. *Folia* semilineam longa, pallide fusco-viridia, sicca parum mutata.

F. CRASSINERVIS, *Thw. et Mitt.*

Folia patentia, 6–9-juga, oblongo-lanceolata acuta, nervo crasso luteo excurrente, margine subintegerrimo, cellulis rotundis limitibusque lævibus pellucidis, lamina vera usque ad medium producta apice uno latere rotundato; pedunculus pallidus; theca ovalis, æqualis, erecta.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis 2 lineas altus, cum foliis $\frac{3}{4}$ lineam latus. *Folia* semilineam longa, pallidissime luteo-fusca, sicca parum mutata. *Pedunculus* lineam altus.

F. MINUTUS, *Thw. et Mitt.*

Folia 4–8-juga, patentia, ovali-oblonga, obtusiuscule acuta, nervo pellucido pallido sub apicem evanido, lamina vera usque ad medium producta, apice parum inæquali, in caulibus sterilibus ubique limbo destituta, in caulibus autem fructiferis præsertim in foliis superioribus limbo usque ad medium laminæ veræ producto marginata, cellulis minutis obscuris areolata; pedunculus, crassiusculus, ruber; theca ovalis, erecta.

Hab. Ins. Ceylon, ad corticem, *Dr. Thwaites.*

Caulis fructifer semilineam altus. *Folia* $\frac{2}{3}$ lineam longa, viridissima. *Pedunculus* lineam altus.

F. semilimbato similis, sed minor.

F. MICROCLADUS, *Thw. et Mitt.*

Caulis inferne nudus, ramosus; folia 6–12-juga, superiora patentia, oblongo-ligulata obtusa, nervo pallido subpellucido in medio laminæ apicalis evanescente, marginibus minute crenulatis, lamina vera ultra medium ascendente, apice valde inæquali, latere ad terram spectante apice rotundato, altero latere cum lamina apicali continuo, ubique limbo destituta, cellulis minutis obscuris subopacis; pedunculus breviusculus, pallidus; theca erecta, ovalis, operculo rostrato.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis lineam altus, inferne sæpe foliis parvis equitantibus acutis remotiusculis, superne longioribus ¼ lineam metientibus intense viridibus fuscescentibus, nervo in junioribus pellucido, in senioribus flavicante, infra apicem longe desinente.

F. Gardneri Brasiliæ simillimus.

F. FLABELLULUM, *Thw. et Mitt.*

Caulis simplex; folia 5–7-juga, oblongo-lanceolata acuta, nervo concolori in apiculum brevem excurrente, margine crenulato, cellulis rotundis parvis pellucidis limitibus latiusculis areolata, lamina vera ad medium producta apice inæquali; pedunculus elongatus, pallidus; theca ovalis, æqualis, suberecta; flos masculus terminalis, foliis basi sinuatis, alis laminæ veræ vaginantibus.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis semilineam altus, cum foliis semilineam latus. *Folia* vix lineam dimidiam longa, pallida læte viridia, sicca vix curvata. *Pedunculus* 2–3 lineas longus. *Theca* minuta.

Habitus *F. exilis,* Hedw.

F. ANGUSTUS, *Thw. et Mitt.*

Caulis basi divisus; folia erecto-patentia, arcte approximata, imbricata, anguste et elongate lineari-lanceolata acuta, integerrima, nervo latiusculo concolori pallidiore in apice evanido, lamina vera ultra medium ascendente, apice subæquali, cellulis rotundis obscuris areolata.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis semiuncialis, cum foliis lineam latus. *Folia* lineam longa, sicca directione immutata, flavo-fusco-viridia.

F. petrophilo, Sulliv. in Proceed. Amer. Acad. Aug. 1861, similis, sed haud nitidus.

F. VIRENS, *Thw. et Mitt.*

Folia 3–6-juga, patentia, elliptico-lanceolata acuta, nervo brevissime excurrente pellucido, margine crenulato, cellulis obscuris parvis papilliferis, lamina vera usque ad medium producta apice æquali, limbo pallido marginata; pedunculus fuscus; theca parva, ovalis, inclinata, basi subinæqualis, operculo rostrato.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis $\frac{1}{2}$–1 lineam altus, cum foliis semilineam latus. *Folia* $\frac{1}{4}$–$\frac{1}{3}$ lineam longa, intense viridia. *Pedunculus* subbilinearis.

F. AXILLIFLORUS, *Thw. et Mitt.*

Folia 6–9-juga, patentia, lanceolata acuta, nervo subpellucido excurrente, margine crenulato, cellulis parvis obscuris papillosis, lamina vera ad medium producta apice æquali, limbo angusto cartilagineo marginata; pedunculus elongatus, ruber; theca ovalis, subæqualis, inclinata; flores masculi plures, axillares.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis lineam altus, cum foliis latitudinem semilineæ parum excedens. *Folia* semilineam longa, viridia, siccitate curvata. *Pedunculus* lineam longus.

F. PLUMULA, *Thw. et Mitt.*

Folia circiter 12-juga, patentia, late oblonga acuta, breviter apiculata, nervo concolori in apiculo evanescente, margine integerrimo, cellulis parvis rotundis limitibusque pellucidis lævibus, lamina vera ad medium producta apice inæquali, limbo angusto pellucido marginata, pedunculus breviusculus, apice curvatus; theca ovalis, horizontalis, æqualis.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis 3 lineas altus, cum foliis $1\frac{1}{4}$ lineam latus. *Folia* $\frac{3}{4}$ lineam longa, dilute lucideque viridia, sicca parum flexa. *Pedunculus* lineam longus.

F. MULTIFLORUS, *Thw. et Mitt.*

Caulis fertilis foliis 20-jugis patentibus oblongis acutis, nervo concolori in apice evanido, margine crenulato, cellulis parvis obscuris, lamina vera ad medium producta apice subæquali, limbo tenui cartilagineo marginata; pedunculus brevis, apice curvatus; theca ovalis, æqualis, horizontalis, operculo rostrato.

Hab. Ins. Ceylon, *Dr. Thwaites.*

Caulis 4 lineas altus, cum foliis lineam latus. *Folia* $\frac{2}{3}$ lineam longa, viridia, sicca parum deflexa. *Pedunculus* lineam longus.

F. plumulæ simillimus, foliis autem obscuris.

F. PENNATULUS, *Thw. et Mitt.*

Caulis elongatus, interdum ramosus, fertilis foliis 20-jugis patentibus approximatis elongate oblongis acutis, nervo pallido breviter excurrente apiculatis, lamina vera ultra medium ascendente, apice subinæquali, limbo fere ad apicem continuo marginata, marginibus reliquis minutissime crenulatis, cellulis minutis obscuris; pedunculus pallidus; theca breviter ovalis, suberecta, inæqualis.

Hab. Ins. Ceylon, ad terram, *Dr. Thwaites.*

Caulis 3–4 lineas altus. *Folia* semilineam longa, viridia fuscescentia. *Pedunculus* linea parum longior.

F. BECKETTII, *Mitt.*

Caulis fertilis foliis 4–5-jugis patulis, sterilis gracilior foliis 6–8-jugis minoribus, omnibus lanceolatis acutis subacuminatis, nervo crassius-

culo viridi in mucronem excurrente, margine limbo angusto viridi circumdatis, lamina vera valde inæquali, uno latere (ad terram spectante) minore, apice in novam descendentem angustato, cellulis satis magnis ovalibus et rotundo-ovalibus subpellucidis; pedunculus elongatus, rufus; theca minuta, ovalis, basi gibba, inæqualis, inclinata.

Hab. Ins. Ceylon (Maanagalla, prov. centr. ad terram), *Beckett*, no. 9.

Caules fertilis sterilisque lineam alti. *Folia* longiora, in caule fertili ¾ lineam longa, in caule sterili dimidiam breviora, omnia pallide viridia, siccitate vix curvata. *Pedunculus* 3 lineas altus, apice pallidus. *Theca* abrupte in pedunculo contracta.

F. exili habitu similis.

EXPLANATION OF PLATE V.

Erpodium ceylonicum.

A. Fig. 1, plant, of the natural size. 2, portion of stem with leaves, as seen from above; 3, a leaf from the upper and one from the under side of the stem; 4, perichætium with capsule and perichætial leaf expanded; 5, calyptra; 6, male flower and perigonial leaf: all magnified.

E. Bellii.

B. Fig. 1, plant, of the natural size. 2, portion of the stem with leaves, as seen from the upper side; 3, leaves; 4, fertile branch with perichætial leaves, capsule, and calyptra; 5, capsule after the emission of the seed; 6, perigonium: all magnified.

Aulacopilum tumidulum.

C. Fig. 1, plant, of the natural size. 2, portions of stem as seen from above and from beneath; 3, a leaf detached; 4, perichætium and capsule; 5, calyptra covering the same; 6, perigonium: all magnified.

A. abbreviatum.

D. Fig. 1, plant, of the natural size. 2, portion of the stem with leaves, as seen from above; 3, leaves detached; 4, perichætium and capsule; 5, calyptra; 6, perigonium: all magnified.

On two new Species of the Genus *Mycoporum*, Flotow.

By the Rev. W. A. Leighton, B.A., F.L.S., F.B.S. Ed.

(Plate VI.)

[Read December 5, 1872.]

Mr. Currey has forwarded to me for examination and determination two lichens on Bamboo, collected in Yomah, Pegu, by Dr. S. Kurz in 1871, and sent to Mr. Currey with some fungi from Calcutta. They are very singular and remarkable plants, apparently referable to the genus *Mycoporum* of Flotow, although they possess peculiarities which lead one to doubt whether they ought not to constitute a separate new genus. Both are, so far as my present knowledge extends, undescribed, and may be characterized and designated as follows:—

1. MYCOPORUM MELASPILON, *Leight.*, n. sp.

Thallus albidus, tenuis, subfurfuraceus, continuus aut subevanescens, linea nigro-fusca limitatus; *apothecia* atra vel fusco-nigra, irregulariter congregata, 8–12- vel plurinodulosa, plano-depressa, excipulo communi involuta; *noduli* rotundati, plano-depressi, interne grumosi, arthonoidei, virescentes, opaci, continentes 7 ascos pyriformes incolores; *paraphyses* nullæ; *sporæ* 8, incolores, cylindraceo-fusiformes, 13-septatæ, maximæ.

On bamboo, Yomah, Pegu, *Dr. S. Kurz.*

The thallus appears to be composed of pale gonidia, and is either persistent or more or less evanescent. The apothecia look like irregular black spots or maculæ—under a microscope, composed of eight or twelve or more round, plane, depressed nodules clustered together and covered with a brownish black continuous membrane or excipulum, which is depressed or sunken in the interstices between the nodules. On viewing a single nodule horizontally with transmitted light, it appears of an opaque green hue, and contains seven colourless pyriform asci, six of which are arranged at intervals around a central seventh. A vertical section shows the nodule to be composed of a thickish green grumous mass, darker on the outer surface, in which are imbedded the asci.

2. MYCOPORUM CIRCULARE, *Leight.*, n. sp.

Thallus albidus, tenuis, continuus, subfurfuraceus, linea nigro-fusca limitatus; *apothecia* consistentia e 6–7 nodulis, atris, rotundatis, subconvexis, verruciformibus, minutis, in circulum dispositis, primo aspectu nudis at realiter coopertis, excipulo communi interstitialiter depresso; *noduli* interne grumosi, virescentes, opaci, continentes 6 ascos rotundatos; *paraphyses* nullæ; *sporæ* 8, incolores, maximæ, oblongæ aut sublineari-oblongæ, muraliloculares, 13-septatæ, loculi 3-4–5 in singulis seriebus.

On bamboo, Yomah, Pegu, *Dr. S. Kurz.*

A still more singular plant than the preceding. The thallus consists of pale gonidia. The nodules are arranged in minute gem-like circles, in number from six to seven, and are like minute subconvex verrucæ, but without any apical pore or epithecium, and are apparently separate, but in reality covered with a continuous membrane or excipulum, concealed partially by the thallus, but seen in a vertical section to be a continuous green grumous mass. Each of the nodules, when viewed horizontally under the microscope, appears as a green grumous mass, in which the asci are circularly arranged.

EXPLANATION OF PLATE VI.

Fig. 1: *a*, lichen, natural size; *b*, apothecium of clustered nodules, magnified 40 times; *c*, nodule, viewed horizontally, magnified 170 times; *d*, vertical section of nodule, magnified 170 times; *e*, spore, magnified under pressure 1000 times. The small circular bodies to the left of the spore (*e*) are gonidia.

Fig. 2: *a*, lichen, natural size; *b*, apothecia, magnified 40 times; *c*, nodule viewed horizontally, magnified 170 times; *d*, vertical section of apothecium, magnified; *e*, spore, magnified 1000 times.

On the Determination of three imperfectly known Species of Indian Ternstrœmiaceæ. By W. T. Thiselton Dyer, B.A., B.Sc., F.L.S.

[Read April 18, 1872, and January 16, 1873.]

The synonymy of the species of Ternstrœmiaceæ contained in the catalogue of Dr. Wallich's herbarium has become in many cases involved. This has been probably in a great measure the result of the misplacement of labels in the sets of specimens originally distributed. It was almost inevitable that such a displacement should take place to some extent, inasmuch as the specimens corresponding to the several numbers in the catalogue were not kept separate in the distribution; on the contrary, they were often laid one upon the top of the other, the numbers being written on loose labels, the juxtaposition of which with the specimens might easily become disturbed.

No great harm would result from this in cases where the type collection is available for correcting mistakes. It so happens, however, that Ternstrœmiaceæ is one of the orders in the Wallichian herbarium in which many of the type specimens are wanting. They appear to have been sent abroad for description, and to have been lost or never returned. In addition to this, there is occasional (though not perhaps serious) confusion anongst the remaining type specimens themselves. One of Wallich's names, for example, is represented by an *Ixonanthes* and a *Gordonia*, both of which are fastened to the same sheet.

It would not have been needful to call attention to these difficulties, except for the purpose of pointing out that the determinations of the Wallichian types given by Choisy in his 'Mémoire sur les Ternstrœmiacées' cannot be relied upon. They appear, in fact, to have been based upon the specimens in the Hookerian herbarium, with no reference to the type collection. Choisy fell consequently into very great errors, to two of the most important of which I propose to call attention.

Camellia? Scottiana, Wall. Cat. 3668.

This plant is represented in Dr. Wallich's type collection by merely a couple of leaves, which had been sent from Munipur in a letter addressed by Mr. D. Scott to Mr. James Kidd, of Calcutta. The postscript is pinned to the sheet on which the leaves are fastened; it states the belief of the writer that they belong to the Tea-plant, and supports this belief by the testimony of a Chinaman staying in the place. It is further suggested that "it is perhaps the same species that Mr. Gardner sent down from Nypal." Mr. Gardner appears to have sent specimens both of the true Tea from an introduced Chinese plant, and also of *Camellia Kissi*, Wall., which, though quite distinct from the Tea-plant, appears to have been distinguished from it at first with some difficulty*. After careful examination I feel satisfied that Mr. Scott's leaves belong to the Assam Tea-plant; the late Dr. Anderson appears, from a MS. note in the Kew Herbarium, to have arrived at the same conclusion.

The documents relating to the discovery of the Tea-plant in Assam are to be found in the 'Journal of the Asiatic Society,' vol. iv. The first is a letter from the Committee of Tea-culture, in which the Committee state that they "were acquainted with the fact that so far back as 1826 the late ingenious Mr. David Scott sent down from Munipore specimens of the leaves of a shrub which he insisted upon was the real Tea" (*l. c.* p. 42). There is no date attached to the leaves in Dr. Wallich's herbarium; but it seems probable that they are the same as those to which the Committee of Tea-culture refer.

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* Asiat. Res. xiii. pp. 428 *et seq.*

In the Kew Herbarium the lithographed label from Dr. Wallich's catalogue belonging to *Camellia? Scottiana* is affixed to a sheet on which are specimens of *Adinandra dumosa*. This is of course the result of accident; but Choisy, without looking any further into the matter, published *Camellia? Scottiana* as a synonym of that plant. It is remarkable also that Dr. Seemann, in his paper on the genera *Camellia* and *Thea**, which contains evidence of his having consulted Dr. Wallich's herbarium, is yet satisfied with remarking that *Camellia Scottiana* "is held to be *Adinandra dumosa*, Jack." I am sure that no person, botanist or not, comparing the leaves of these two plants, could acquiesce in their identity.

Ternstrœmia? coriacea, Wall. Cat. 1453.

On p. 158 of Dr. Wallich's catalogue, *Camellia axillaris*, Roxb., is given as a synonym of this plant, on the strength of a specimen labelled with that name in Dr. Roxburgh's handwriting. On the other hand, the plant now known as *Gordonia anomala*, Spreng., is figured in the 'Bot. Reg.' t. 349, as *Camellia axillaris*, Roxb., and in the text a brief diagnosis, stated to have been taken from a MS. of Roxburgh's in the Banksian collection, describes Roxburgh's plant as having serrulate leaves and a silky calyx. I have tried to trace this MS. in the Banksian Library, but without success. It is clear, however, that the plant from Roxburgh's herbarium, having entire leaves and a smooth calyx, cannot be the plant he intended for *Camellia axillaris*. What that really was, there is perhaps now no material for certainly knowing. If it was identical with *Gordonia anomala* (which is not improbable), there must have been some mistake as to its original source of introduction into the Calcutta Botanic Garden. For the latter plant is only known from South China; and if, as stated in the 'Bot. Reg.,' it was obtained from Penang, it can only have been from a garden. Don placed the plant figured in the 'Bot. Reg.' in his genus *Polyspora*; and Choisy, guided apparently merely by the synonyms, and evidently without comparing the plants, determined *Ternstrœmia? coriacea*, Wall., to be the same as *Polyspora axillaris*, Don. Now, whatever doubt there might be as to Roxburgh's plant, there can be none as to Don's; and therefore this determination of Choisy's is certainly wrong. I agree with Dr. Anderson in identifying Wallich's plant with *Adinandra acuminata*, Korth.

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* Trans. Linn. Soc. vol. xxii.

Ternstrœmia? khasyana, Choisy.

In his memoir, Choisy describes (p. 20) a specimen in the herbarium of M. Boissier which had been collected by Griffith in Khasya, and distributed by him with the number 422. Choisy states that he had seen the same plant in the Paris herbarium; and he refers it as a doubtful species to *Ternstrœmia* under the name of *T.? khasyana*. Some doubt at once arises as to the correctness of this determination, from the small number of stamens (10) observed by him. The examination of the type specimen, which was most kindly intrusted to me by M. Boissier, proved that Choisy was in error as to the number of stamens, since they are really indefinite. Although, however, the plant possessed a facies remarkably similar to that of many Ternstrœmiaceæ, it certainly did not belong to any Indian species. With the aid of Professor Oliver, I finally succeeded in identifying the rather fragmentary type specimen with numerous examples of *Illicium Griffithii*, H. f. & T., in the Kew herbarium, which had been collected in Khasya by Griffith, and bore the same distribution-number (422). There is a marked agreement of "adaptive" characters between *Illicium Griffithii* and *Ternstrœmia japonica*, Thb. In fact, acute-leaved specimens of the latter, also collected in Khasyah, closely resemble, in the dried state, the *Illicium*, both as regards the leaves and the external aspect of the flowers.

Extract of a letter from Major-General MUNRO, C.B., to Mr. BENTHAM, dated May 29, 1872.

MY work anent botanizing has been in Jamaica, where I recently spent six weeks, and pretty fairly explored about two thirds of the island towards the west. Generally speaking, it is not so interesting a botanical country as Trinidad or St. Vincent. The same plants prevail over large areas, caused, I presume, by the general homogeneity of the geological formation, principally limestone. There are few showy flowers and creepers; and I scarcely recollect seeing any variegated plants in the woods. A large extent of country is almost devoid of water, except when the rains are actually falling; and several of the rivers disappear underground for miles through some of the crevices and between the great beds of the white limestone; so that dripping rocks and moist dells, where Flora loves to dwell, are rare. I am now speaking of the western half of the island. Portlandias, Solandras, and Bromeliaceæ (rather numerous species) and the really only very common Orchid *Broughtonia sanguinea*, together with *Amaryllis equestris*, in clumps of a hundred, are the principal native handsome flowering plants that are to be seen. The roadsides are margined for miles with the pretty berries of the *Abrus precatorius* and the showy yellow flowers of two species of *Stigmaphyllum* and one species of *Echites*. The ordinary roadside weeds following you everywhere are the red and white varieties of *Asclepias curassavica* and *Bidens bipinnatus*. I have never seen a single handsome Compositous plant in Jamaica wild. Down the lovely valleys of Acton river the ferns are very grand in size, but not numerous in species. I measured a frond of *Dicksonia dissectá*, which I found to be 14 feet long. Several of the ferns are dimorphous; and I was surprised to find one species of *Anemia* the most abundant of all the ferns. I omitted to mention amongst the ornamental native flowering plants *Bletia purpurea*, of which I have seen five hundred at a time growing within a space of very few yards. Two or three of the *Melastomaceæ* are ornamental for their foliage; and on the mountains of Newcastle *Blakea trinervis*, often called Mountain-rose, is very ornamental in flower. Foreign plants contribute greatly to the beauty of Jamaica. The varied hues of the leaves of the Mangoes are beautiful in the extreme; and I never recollect observing the same effect in India. The Mangoe is spreading itself everywhere, and in fifty years will be the principal tree in the island. The soil of Jamaica is very well suited for many foreign plants; and the hills about Newcastle are beautifully gay with *Phaius Tankervillæ* in thousands, *Cuphea*, *Agapanthus*, *Moræa*, *Tephrosia purpurea*, *Alpinia nutans*, the variegated form of *Abutilon Thompsoni* spreading abundantly from seed, *Calla æthiopica*, *Amaryllis*, myriads of *Brugmansia*, Roses (very fine), Furze, Strawberries, &c. They are beautiful to look at; but you can scarcely recognize among them a native plant. In the Blue Mountains there is always moisture; and there the vegetation of foliage is very glorious. On the fern-walk above Newcastle, in an hour's time, I collected seven or eight different species of Tree fern, including *Pteris aculeata*, or an allied species; *Hymenophyllum* and *Trichomanes* are there also in abundance.

On a new Genus in the Order Mucedines.

By Frederick Currey, M.A., F.R.S., Sec. L.S.

Plate VII.

[Read June 20, 1872.]

The plant here described was brought to my notice by Dr. R. O. Cunningham, F.L.S., who had received an account of it from Dr. D. D. Cunningham, of Calcutta, where the fungus is found in the rainy season covering the flowers of *Hibiscus rosæ sinensis.* I have since corresponded with Dr. D. D. Cunningham upon the subject, and received from him further information, accompanied by some admirable drawings; and I am thus enabled to lay before the Society the following account of the fungus in question.

The mycelium traverses the tissue of the fading corolla of the *Hibiscus*, and is only scantily jointed. The fertile threads are erect, unbranched, and continuous. These threads are swollen at the apex; and from the swollen apex proceed numerous shortly stalked pyriform cells, which ultimately form the funnels hereafter to be noticed. The spores originate from the above-mentioned cells in the manner shown in fig. 6 (Pl. VII.), which represents a cell very highly magnified, with the young spores attached. At this stage of growth there is no differentiation of one part of the cell from the other; but shortly afterwards a line appears cutting off the upper portion of the cell, to which the spores are attached, as shown in fig. 5. This upper portion ultimately collapses and sinks down, or falls inwards, as it were, carrying with it the ripe spores. The subsequent fate of this collapsing membrane is not very clear; but it seems probable that it decays, and thus sets free the ripe spores. The result, however, is that the spores eventually become detached, and the cells, which were originally pyriform, assume the shape of stalked funnels still attached to the capitate portion of the fertile thread. This condition of the fungus is shown in fig. 3, where the spores have almost disappeared, a few detached ones being still visible in some of the funnels, and one of the latter being still quite full of spores. It happens occasionally that the margins of the funnels, instead of being entire and sharply defined, exhibit irregular torn fragments of membrane, being obviously the remains of the collapsed upper portion. On one occasion Dr. Cunningham observed a funnel from which the spores had escaped, leaving a bladder-like protrusion, which had shrunk away from the funnel, but had not become detached. From the appearance presented in this instance, and which is shown in fig. 8, it would seem that the bladder-like protrusion must be the inner membrane of the capitate cell, from which the upper portion of the outer membrane has become detached by a sort of circumscissile dehiscence. The ripe spores of the fungus are obovate and of a deep madder-brown colour.

With regard to the classification of this interesting plant, it is not easy to find a fitting place for it. It belongs, of course, to the order *Mucedines*; but there is not in that order, as far as I know, any genus to which it is at all nearly related. The peculiar character is the differentiation of the upper and lower portions of the sporiferous cells and the formation of the funnels by the collapse of the upper portion. I propose for its reception a new genus, to be called *Cunninghamia*, which may be thus characterized:—

CUNNINGHAMIA, novum genus.

Mycelium repens, sparsim septatum: *flocci fertiles* simplices, erecti, ad apices clavato-incrassati, sporophoris ornati: *sporophoræ* primum pyriformes, dein, parte superiore subsidente, infundibuliformes: *sporæ* juniores hyalinæ, maturæ rubro-fuscæ, capitulis densis stipatæ, dein in infundibulis acervatim cumulatæ.

Unica species:—

CUNNINGHAMIA INFUNDIBULIFERA, Curr.

Hab. Ad petala marcescentia *Hibisci rosæ sinensis*, in horto botanico apud Calcuttam tempore pluvio.

EXPLANATION OF THE PLATE.

Fig. 1. A spore germinating, and a portion of the mycelium from the tissues of the corolla of *Hibiscus rosa sinensis*, magnified 330 times.

Fig. 2. A fertile thread, viewed by reflected light, magnified 65 times.

Fig. 3. A fertile thread past maturity, most of the spores having fallen and the sporophores having collapsed and assumed the shape of funnels, magnified 103 times.

Fig. 4. Three funnels, with a small portion of the clavate apex of the fertile thread. The fragments of membrane adherent to the edges of the funnels appear to be the remains of the upper, collapsed portion of the sporophores.

Fig. 5. An immature sporophore, with young spores, showing the line of demarcation at which the sporophore eventually collapses, magnified 330 times.

Fig. 6. A similar sporophore before the formation of the line of demarcation, with five young spores attached, magnified 700 times.

Fig. 7. A ripe spore, magnified 330 times.

Fig. 8. A sporophore past maturity, exhibiting a bladder-like protrusion, being apparently the inner membrane of that portion of the sporophore which was above the line of demarcation.

Notes on the Classification, History, and Geographical Distribution of Compositæ. By GEORGE BENTHAM, F.R.S., P.L.S.

[PLATES VIII. to XI.]

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I. INTRODUCTION.

THE Compositæ are at once the largest, the most distinct, and the most uniform, and therefore the most natural, of all orders of Phænogamous plants. Nearly ten thousand known species are separated from each other by characters most of which are usually considered as only of secondary importance; and I cannot recall a single ambiguous species as to which there can be any hesitation in pronouncing whether it does or does not belong to the order. The very few cases where species have been erroneously referred to or excluded from it have been the result of conjectural determinations of imperfect specimens, or of gross ignorance on the part of the observer. The andrœcium, gynæcium, and fruit, as to all the essential characters of number of parts and relative position, the seed and its embryo in every particular, are absolutely uniform throughout the order; or in the very few cases of a slight variation (as, for instance, in the shape of the cotyledons) the differences are no more than specific, varying in one and the same small genus. To distribute, therefore, these ten thousand species into thirteen tribes and above seven hundred and sixty genera, we are compelled to derive our characters from inflorescence and its rhachis and bracts, from the pappus or abnormal development of the rudimentary calyx, from the shape of the corolla, from sexual abortions, from appendages to the anthers, from the external form or appendages of the style-branches, and from very slight variations in the external form of the fruit, many of which, in other orders, are scarcely reckoned of more than specific value.

In Linnæus's artificial sexual system the sexual characters were necessarily taken as of primary importance, and the Compositæ, forming the chief portion of the class *Syngenesia*, are divided into four orders:—*Polygamia æqualis*, with all the flowers (or, as it is more convenient to call them, the florets) of each head hermaphrodite and fertile; *Polygamia superflua*, with the florets of the circumference female, those of the disk hermaphrodite, and all fertile; *Polygamia frustranea*, with the florets of the circumference barren, those of the disk hermaphrodite and fertile; and *Polygamia necessaria*, with the florets of the circumference female and fertile, those of the disk hermaphrodite but barren. To these Linnæus added a fifth order, which, notwithstanding its analogous name *Polygamia segregata*, is not founded on any sexual distinction, but on inflorescence only, being characterized by the numerous unifloroous heads crowded on a common receptacle.

Such an arrangement proved, however, to be purely artificial; the strikingly different groups, for instance, of the Hawkweeds and Thistles, are amalgamated with a few others with which they have evidently no other connexion than as members of the same family, into the first Linnean order; and notwithstanding the endeavours of most subsequent synantherologists to maintain as much as possible the value originally attached to these sexual distinctions, they have felt repeatedly compelled to unite into single or closely allied genera, species which would, on these Linnean principles, be distributed over most or all of his orders.

Jussieu and Ventenat, following up the ideas broached by Vaillant, considered the *Syngenesia polygamia* of Linnæus as a class, under the name of COMPOSITÆ, dividing it into three families or natural orders—*Cichoriaceæ*, *Cynarocephalæ*, and *Corymbiferæ*,—an arrangement which, up to the date of De Candolle's 'Prodromus,' was generally followed by the latter, as well as by most other French botanists—considering, however, the class as a natural order under the Jussieuan name of *Compositæ*, and his three families as so many suborders, to which Lagasca and De Candolle added a fourth under the name of *Labiatifloræ*. Of these suborders the *Cichoriaceæ*, with the corollas all ligulate, have ever since maintained their ground as the most natural as well as the most accurately defined group in the whole order; the three others have been very variously modified or subdivided into tribes, none of which can as yet be considered as separated by any absolute characters.

Henri Cassini was the first who undertook a general revision and redistribution of Compositæ. Leaving the Cichoriaceæ undisturbed as a distinct tribe (changing the name, however, to *Lactuceæ*), he rearranged the great mass of tubuliflorous Compositæ upon new principles. His long series of articles, some of them first sketched out in the 'Bulletin des Sciences de la Société Philomathique,' were distributed over the sixty volumes of the 'Dictionnaire des Sciences Naturelles,' some of the more general ones collected in his 'Opuscules Botaniques;' the whole published between the years 1816 and 1834. These papers include a large number of very valuable observations, the result of the study of as many species as he could obtain in a living state, or could examine in the herbaria of Jussieu and others. He was the first to make use of the modifications of the style and anthers in the general systematic arrangement of the order; and he clearly exhibited the functions of the *collecting*, or, as he not inaptly terms them, *sweeping* hairs and papillæ (*poils collecteurs, poils balayeurs, papilles balayeuses* of Cassini, *Fegehaare* of Hildebrand). His table, or, rather, map, of the tribes (plate 1 of the 'Opuscules') shows a just appreciation of the natural affinities of the order, and of the principal groups of which it is composed, and in some respects, as in the tribe of Inuleæ, gives a better arrangement than those of Lessing and De Candolle. Unfortunately, however, in working out the details of the genera in the 'Dictionnaire,' he indulged in an enormous and useless multiplication of generic names, which only tended to throw the nomenclature into confusion, and cast a slur upon all his labours. Wherever he observed a slight difference in the involucre, pappus, or general aspect, or could not readily identify an imperfect specimen, an engraved figure, or a description often incorrect, he at once set it down as a new genus, and has thus, more than any other botanist of equal ability, overloaded the science with useless synonyms. So recklessly, indeed, did he give way to this mania of coining new names, that he on many occasions proposed two, or even three, for the same genus, leaving future botanists to take their choice.

Robert Brown, in his memoir in the twelfth volume of our Transactions, with his usual accuracy, elucidated many obscure points in the structure and affinities of several genera of the order, here as elsewhere indicating even much more than he expressed in detail, but did not touch upon the general arrangement or distribution of the genera.

David Don, in the years 1828 to 1832, published in the Edinburgh New Philosophical Journal and other periodicals, as well as in our own Transactions, various monographic papers on Compositæ, chiefly on Cichoriaceæ and on South-American Mutisiaceæ and a few others. In his new genera he made use of some neglected characters derived from the venation of the corolla &c. but he seems to have consulted but very little the works of his predecessors, and to have been quite unaware of the important peculiarities of the style pointed out by Cassini.

Lessing, after some preliminary papers in the 'Linnæa,' published, in his 'Synopsis Generum Compositarum,' a new arrangement of the order, founded, still more than Cassini's, upon the modifications of the style, proposing many alterations in Cassini's groups, which cannot always be considered as improvements, except in so far as they resulted from a command of more ample materials. Cassini's tribes and subtribes are generally natural, although his genera are often species only. Lessing's tribes and subtribes are very technical, whilst the main characters are not always sufficiently absolute to give them the advantages of an artificial classification; and in his genera he often relies too much on the pappus, the variations of which are less in conformity with general differences than those of almost any other organ.

De Candolle, when he arrived at the Compositæ for the 'Prodromus,' had before him far more extensive collections than any of his predecessors. He had in former years worked out monographs of some portions of the order; and he now set to work, with his usual ardour and methodical mind, to the diagnosis and systematic arrangement of a mass of species nearly equal in number to those of the whole vegetable kingdom known in the days of Linnæus. But a severe attack of illness came on shortly after he had commenced; and on resuming work after the lapse of a couple of years, although his ardour and perseverance remained, he was no longer so well able to grapple with complicated difficulties.

He followed Lessing too closely where his own more perfect specimens might have shown errors; and in the numerous new genera he proposed, he, in too many cases, neglected the verification of the tribual characters which from their aspect he presumed them to possess. Thus it is that identical species, for instance, are not unfrequently repeated in different tribes, and that the most closely allied genera are often widely separated without cross references to indicate their connexion, the general result being that further researches have occasioned greater changes in proportion in this than in any other part of the 'Prodromus.'

C. H. Schultz Bipontinus, devoting many years of his life exclusively to this order, considered himself, and was regarded by many others as the great synantherologist of his day; but he did not live to work out any general system. In his numerous detached papers he modified the circumscription of many genera, corrected errors, and consigned to print many valuable observations; but he seemed always too much in haste to bring out something new, to divide or to consolidate old genera, changing long lists of names of species of which he had only examined one or two, to alter upon slight grounds the scale of relative value previously given to generic characters, without, however, relinquishing the idea that there exists in nature such a scale possessing a high degree of fixity, and in general to affix his own stamp upon all future synantherological labours. Where he has taken time to work out his monographs in detail his observations have appeared to me reliable for their accuracy; but where he has proceeded hastily it is difficult to follow him. His determinations, for instance, of Mandon's Bolivian, of Riedel's and Langsdorff's Brazilian, of Liebmann's Mexican Compositæ are replete with misnomers. There are other points also in which either I cannot quite agree with him, or from which I should differ widely. His multiplication of species is sometimes carried very far. His reliance chiefly upon the form of the achene for generic distinctions is in some cases a great improvement, in others carried so far as to become purely artificial. I must agree with him in his high estimation of the labours of Cassini; but that does not appear a sufficient reason for adding one more to the numerous names already given to the order. Even for those who maintain that all natural orders must be named after some one of their genera, with the affix of *aceæ*, there is Lindley's name of *Asteraceæ*, which has the right of priority over that of *Cassiniaceæ* proposed by Schultz, besides that the genus *Aster*, being so much better known and (slightly modified) so much more universally distributed than the little-known local genus *Cassinia*, is much better suited for a so-called ordinal type.

Of all the modern contributions to the study of Compositæ none are more important for the accuracy of observation and the due appreciation of characters and affinities than those of Asa Gray. His views (first exemplified in the 2nd volume of the 'Flora of North America,' further carried out in a long series of memoirs or detached papers on the Compositæ of various collections published in the 'Smithsonian Contributions,' in the reports of various American exploring or surveying expeditions, in the Proceedings of the American Academy, of the Boston Society, in Hooker's Journals of Botany, and other periodicals) may always be implicitly followed without any danger of being led into error, although sometimes a difference of opinion may exist upon such minor points as the generic or subgeneric value to be given to a group. The only real difficulty in his case arises from the dispersion of his papers in such a large number of publications, not always within reach of the generality of botanists, and some of which it is scarcely possible not to overlook.

There are many others whom I might mention as having contributed more or less beneficially or prejudicially to our knowledge of Compositæ; but that would require the enumeration of the greater number of modern systematic botanists. Compositæ are so easy to examine, that botanists of very little experience are readily led into the belief that they have mastered every thing relating to a specimen they are examining; and if they discover some point not quite agreeing with the technical characters of the genus it is presumed to belong to, they are at once ready to establish a new one; and there are few orders which have been so universally dabbled with, or where there have been so many repetitions of species, of genera, or of observations. The literature of *Hieracium* and of *Aster*, for instance, is almost, if not quite, as bulky as that of *Rubus* and of *Rosa*; and generally the synonyms of this part of our 'Genera Plantarum' are nearly twice as numerous as the adopted generic names.

There are, however, among the numerous more speculative naturalists whom the promulgation of the Darwinian theories have called into action, two who require notice as having specially taken up the subject of Compositæ with reference to those provisions for cross fertilization originally pointed out by Cassini, and with more or less of recognition forming the basis of the systems of classification of Lessing and De Candolle, but more or less neglected or ignored by Don, by Schultz Bipontinus, and by most of the minor more specific synantherologists. Of the two theorists I allude to, Prof. F. Hildebrand, of Bonn, and Federigo Delpino, of Florence, the former has published, in the last volume of the 'Nova Acta Naturæ Curiosorum,' elaborate observations, accompanied by excellent illustrations, of the fecundating apparatus of thirty species of Compositæ belonging to most of the principal groups of the order. In the general considerations which follow, he endeavours to show that in Compositæ, at least, all observations indicate that unisexuality where it exists has proceeded from hermaphroditism, and that the primitive parent of the order had capitula consisting entirely of protandrous hermaphrodite florets—a conclusion which may be a correct one, but for which the data at hand are wonderfully few. The same writer has a paper in the last number of the 'Botanische Zeitung' on the means of dispersion supplied by the fruits of Compositæ, upon which I may have to make some observations when speaking of geographical distribution.

Delpino, in his 'Studi sopra un legnaggio anemofilo delle Composte,' amidst many shrewd and instructive observations on the dichogamic arrangements of Compositæ in the comparatively few species he has had the opportunity of studying, supplements them rather largely from the sources of imagination. Attaching the greatest importance to the Darwinian distinction he has on various occasions worked out, between *anemophilous* and *zoidiophilous* plants (those which effect cross fertilization by the agency of winds or by the agency of insects), he considers that evidence derived from this character alone is sufficient to prove descent and affinity, without taking into account the numerous cases alluded to by Darwin, and some of which are mentioned by Delpino himself in this very paper, where important variations in this respect occur in different species of one and the same genus. His genealogical tree of Artemisiaceæ, from Campanulaceæ down to *Xanthium spinosum*, his statements, as proved facts, that Campanulaceæ transmitted hermaphroditism through Lobeliaceæ to their descendants the Compositæ, that Compositæ inherited proterandry from Lobeliaceæ, but acquired in many cases unisexuality during subsequent generations, are mere conjectures. So in proposing his tribe of Artemisiaceæ to include Ambrosieæ and exclude Tanaceteæ, a tribe which he characterizes as irrefutably natural, it appears to me that by relying for it solely on one character (the anemophilous fertilization) his classification becomes as artificial as when Linnæus relies solely on the repartition of the sexes, Lessing on the shape of the style-branches, Schultz Bipontinus on the shape of the achene, or others on the pappus alone. As to his idea that heterogamous capitula with fertile female ray-florets and sterile disk-florets may be regarded as simple hermaphrodite proterogynous flowers descended from inflorescences of proterandrous flowers, this is surely but little more than a play upon words.

With regard to the part I have myself taken in the elaboration of this great order, I may observe that, long before I was called upon to undertake it for our 'Genera Plantarum,' I had had repeated occasion to test the value of the labours of my predecessors, and for various publications had examined in detail the Compositæ of Europe, of British Guiana, of tropical Africa, of China and allied Indian forms, and especially of Australia; and I have now, with the aid of the rich stores and extensive library collected together at Kew, and liberal assistance in the way of loan of specimens or notes on typical specimens in Continental herbaria, communicated by my friends M. Decaisne and M. Cosson of Paris, Dr. Ascherson of Berlin, and Dr. Fenzl of Vienna, been enabled to examine specimens and compare the original descriptions of an immense majority of the published genera, subgenera, or sections, as well as of numerous species which have been supposed to present some anomaly, or which by their aspect seemed to suggest some peculiarities which might affect the generic character. Notwithstanding, however, the lengthened period which I have devoted to this tedious labour, I feel that there is yet much left to be done to future synantherologists who can undertake throughout a specific monograph, such as I have only been able to do with regard to the Compositæ of some countries or of a limited number of genera. There are also certain characters, and some of them evidently important, which our herbarium specimens often do not supply. Perfectly ripe achenes are often wanting in whole genera; and microscopical characters, such as the form of the pollen, upon which much stress has been laid of late years, have been observed in too small a number of species to ascertain their real connexion with general affinity. In general my chief labour has been the testing and verifying or reconciling the observations of others, although this has always been preceded by the examination of specimens and drawing up my own generic character, afterwards modifying it when necessary in points elicited by others which I had at first overlooked. The principal changes I have proposed in the general methods of Lessing and De Candolle were determined upon and worked out long before I was aware that they were in a great measure a return to that of Cassini. The confusion which his multiplication of names had produced, and the unusual terminology of his descriptions, had excited in my mind a prejudice against him, until, after completing my work of detail, I came to study his generalizations, which showed how much better his views of affinities coincided with mine than those of his successors; and I have since had the satisfaction to learn that the principal of these changes I have made have also met with the approval of such careful observers as Asa Gray and Ed. Boissier. It is scarcely necessary to add that in this, as in other parts of our 'Genera Plantarum,' any important changes which either Dr. Hooker or myself have proposed in the orders we have respectively undertaken, have always been after consultation and in concert with the other.

II. Comparative value of Generic Characters.

Before entering into a general outline of the main divisions we have adopted, some explanation is required of the principles upon which we have conformed to or departed from the systems of our predecessors; we must form to ourselves some idea of the comparative value of the various characters put forward by different synantherologists; and for this purpose it will be necessary severally to consider them in some detail. We may take them in the following order:—1. Sexual differences; 2. Di- and trimorphism; 3. differences in the Pistil, 4. in the Fruit, 5. in the Andrœcium, 6. in the Corolla, 7. in the Calyx, 8. in the ultimate Inflorescence and bracts (*i. e.* in the capitulum and its receptacle, involucre, and paleæ), 9. in Foliage, 10. in Habit, stature, and general inflorescence, and, 11. in Geographical distribution.

1. *Sexual Differences.*

Characters derived from this source were, as already observed, considered of the highest importance by Linnæus, who founded on them his primary divisions of the order. Subsequent systematists have gradually placed them lower in the scale, but yet have, generally speaking, regarded them as absolute for the distinction of genera. Schultz Bipontinus, however, in some of his later generic changes, has shown a disposition to neglect them, apparently from having observed their little accordance in certain cases with generic groups he was disposed to form on other grounds. But I have been unable to ascertain how far he generalized this degradation of the character. My own observations would lead me to conclude that, like other characters, sexuality varies in value in different tribes and in different genera, in a few cases absolute even in tribes, often of considerable importance in genera, but often also specific only, or at most available for sections or artificial groups of species.

These sexual differences relate to those of the individual flowers or florets within the head, and those of the flower-heads taken generally.

With regard to the individual florets, it is usual to distinguish four kinds—hermaphrodite, male, female, and neuter; but the sterility of the pistil is often so uncertain or variable in the anther-bearing flowers, in which it is never absolutely deficient, that I have found it much more convenient to designate as *hermaphrodite* all florets having perfect anthers, whether their pistil be susceptible of fertilization or not, distinguishing them as fertile or sterile—and as *female* all florets in which the anthers are abortive or deficient and the style is present; the neuter florets, reduced to a corolla with a rudimentary scarcely distinct ovary, might be classed in the same category as the females, as the abortion of the style is sometimes gradual or uncertain. Thus reducing the kinds of florets to two when both occur in the same head, the hermaphrodite ones invariably occupy the centre, the females being placed in one or more concentric rows in the circumference. Nuttall had indeed published a genus which he characterized from the supposed singular inversion of this position, the females being, as he believed, in the centre, surrounded by males, and gave it, therefore, the name of *Parastrephia*; but upon inspecting the original specimen in Nuttall's herbarium (a mere fragment gathered by Curson near Arequipa) it appeared to me that he had been deceived by some degree of unisexuality in the flower-heads, some having nearly or perhaps all the florets female and therefore central as well as circumferential, whilst one of the heads appeared to be entirely hermaphrodite. There are not heads enough on the specimen to verify the fact; but I at once recognized the plant as one of which we have good specimens from the same locality, and which Meyen placed in *Baccharis* (*B. phylicæformis*, Meyen) on account of its general affinity, but which Walpers *invita natura* transferred to *Vernonia* on account of the pappus. In these specimens the relative position of the hermaphrodite and female flowers is normal, although Nuttall's genus can be sustained as distinct from *Baccharis* on other grounds. Sterility may be more or less perfect either in the central florets, extending outwards more or less to the greater portion or to the whole of the hermaphrodite ones, or in the female florets, but extending never, as far as I am aware, within the outermost row; or, in one and the same head, both the outer female and the innermost of the hermaphrodite florets may be sterile.

In three of the principal tribes, Vernoniaceæ, Eupatoriaceæ, and Cichoriaceæ, uniform hermaphroditism of the florets is, I believe, quite constant, and the sterility of any of them (other than accidental) very rare and exceptional. So far, therefore, Linnæus's order of Polygamia æqualis is maintainable, the presence of any female florets at once excluding from either of these tribes any plant supposed to belong to them; but the character goes no further as a tribual one. In Cynaroideæ an outer row of female or neutral florets occurs in a few genera, but is not constant even in the same genus; in Mutisiaceæ it is more frequent and more constant. In the remaining eight orders the presence of one or more rows of female florets is the rule, but with exceptions, sometimes in single species of large genera where it is usually constant, sometimes in the majority of species or in whole genera, and in two subtribes of Inuloideæ very prevalent or quite constant. In all these cases we are therefore obliged to be very cautious in making use of the homogamous or heterogamous flower-heads as an absolute generic distinction. Still less value can usually be attached to the sterility of the inner or outer florets, although in some cases it appears to be positively generic or even subtribual. The central hermaphrodite and outermost female row of florets are constantly sterile in some Calendulaceæ, all the hermaphrodite florets constantly sterile in the subtribes Millerieæ, Melampodieæ, and Ambrosieæ, of Helianthoideæ, and in some genera of other subtribes or tribes; in other genera the greater or less sterility of the central florets is of no more than specific value. The sterility of the circumferential florets (reduced in that case to a corolla with a rudimentary or small abortive ovary without style or stamens, and therefore called neuter) has been considered by many synantherologists an absolute generic indication; and although now generally abandoned in the case of the enlarged neutral florets of some Cynaroideæ, it has been strictly adhered to by Lessing, De Candolle, and others in the case of Asteroideæ, Helianthoideæ, and others with radiate flower-heads. But in many genera it appears to establish a purely artificial distinction; it separates from large and natural genera a few species or a single one without any other peculiarity but what every one admits is purely specific; and besides it is in these cases not always strictly constant. I would therefore, with Schultz Bipontinus, reunite *Galatella* with *Aster*, *Delucia* with *Bidens*, *Leptosyne* and others with *Coreopsis*. In some Helianthoideæ, however, it prevails through so large a number of species, otherwise evidently congeners, that I have adopted it among the essential generic characters of *Helianthus*, *Viguiera*, *Tithonia*, *Oyedæa*, *Gymnolomia*, *Rudbeckia*, &c.—and even as the sole generic distinction between *Aspilia* and *Wedelia*, *Actinomeris* and *Verbesina*—but more as a matter of convenience than of conformity to nature, in large groups of species where no better principle of subdivision has yet been proposed. This sterility of the ray-florets is yet more constant in the majority of the genera of the tribe Arctotideæ, though here, again, there are a few, such as *Arctotis* itself, where they are fertile.

Unisexuality of flower-heads is sometimes a constant generic or subtribual character; the heads are, for instance, constantly monœcious in Ambrosieæ, constantly diœcious in Petrobieæ, Tarchonantheæ, *Baccharis*, *Lycoseris*, *Moquinia*, &c. In these cases the male heads always consist of hermaphrodite sterile florets, with the anthers perfect, the style always present, but the ovary abortive and usually reduced to a mere rudiment; in the female heads the pistil is perfect, the anthers often present, but free and without pollen, or reduced to small rudiments or entirely deficient. In several Inuloideæ (Plucheineæ or Gnaphalieæ) the unisexuality of the flower-heads is less perfect and more inconstant, the male heads having occasionally a few female fertile florets in the circumference, the females one, two, or more hermaphrodite and sterile ones in the centre, and the proportions varying sometimes from species to species or from individual to individual.

2. *Di- and Trimorphism.*

Di- and trimorphism in individual florets is usually connected with unisexuality, the female corollas being either more slender than the hermaphrodite, or with a more expanded irregular or ligulate limb, or those of the outer rows ligulate and of the inner rows slender; or they may be reduced to a mere rudiment or entirely wanting; and the pappus may also differ, that of the female florets being often reduced from that of the hermaphrodites or entirely wanting; but the value of these differences is usually no greater than as an indication of sexuality. The reduction or alteration of the pappus in the female florets, so often taken advantage of as a generic distinction, very frequently produces a purely artificial separation of a very few or of a single species from a genus otherwise natural, and is now generally abandoned by A. Gray and others. On the other hand, with regard to dimorphism in the corollas, although the presence or absence of female florets is often not even of generic value, the form they assume when present, whether tubular like the hermaphrodites but more slender, or ligulate, is sometimes of subtribual importance, as in the case of the separation of the last four subtribes of Inuloideæ from the first six, of which this is one of the principal characters. In unisexual flower-heads the female corollas are always more or less reduced, never having the expanded or ligulate limbs so frequently observed in heterogamous heads.

Dimorphism in the flower-heads independent of the sexes is very rare in Compositæ, and, as far as hitherto observed, only of specific value. Linnæus had already informed us that in *Gerbera* (*Anandria*) *bellidiastrum* the vernal flower-heads are heterogamous and radiate, and the autumnal ones homogamous and discoid; and analogous dimorphisms have since been observed in a very few scattered species. Delpino has also observed a certain degree of dimorphism in the female flower-heads of two species of *Franseria*, which on that account he establishes as two distinct genera—a separation in which it is very difficult to concur.

3. *Differences in the Pistil.*

The ovary and ovule, as to their structure, insertion, position, and other relations to other parts of the flower, are absolutely uniform throughout the order, and afford no clue to generic or tribual distinctions. Nor is the style itself more available in the case of the female florets, where its sole functions are those devolving upon it as a portion of the female organ—the receiving the pollen and conveying it to the ovary. These styles of the female florets are uniformly divided into two equal more or less stigmatic branches, glabrous without and papillose inside, which may occasionally vary in length or thickness, but only slightly so, and very rarely, as far as I have been able to observe, so as to give any but a very slight generic clue. It is the style of the hermaphrodite florets, in its usually principal and often sole function of sweeping the pollen out of the antheral tube, that presents those external differences which by Lessing and De Candolle have been taken as absolute tribual characters, and which are in fact, generally speaking, important and useful, but which are also liable to numerous exceptions. As an instance of the confusion resulting from the use made of this character, I may point out that in the illustrations of the styles of eight of the principal tribes given in Lindley's 'Vegetable Kingdom,' p. 703, two (n. 2 and 3) have not the forms characteristic of the tribes they represent, and, indeed, are taken from genera which, although included by De Candolle in Eupatoriaceæ and Asteroideæ respectively, have been erroneously there placed, whilst three others (n. 5, 6, and 7) are far from being typical of the majority of their cotribuals.

Referring to the diagrams which I have here given, Plate X., there is no doubt that the styles of the large genera *Vernonia* (fig. 2), *Eupatorium* (fig. 3), *Aster* (fig. 4), *Senecio* (fig. 6), and *Carduus* (fig. 8) are prevalent also in a considerable number of genera closely connected with them on other accounts; but, on the other hand, some of these forms are to be met with in genera naturally far removed from them, or are not in closely allied genera, or, again, are so connected with each other by intermediate forms as to render them in some cases useless even as artificial characters.

The *Vernonia* style (fig. 2), with its long, slender, almost acute branches, nearly equally hirsute throughout, with the stigmatic series scarcely prominent on the inner surface towards the base, is, I believe, constant in the 35 genera and near 500 species of the tribe; but it is also to be met with in a few genera which on every other account must be placed either in Asteroideæ (e. g. *Chrysopsis*), in Inuloideæ, or in Senecionideæ (e. g. *Liabum* and *Gynura*). The *Eupatorium* style (fig. 3), with long, obtuse or club-shaped branches only minutely papillose instead of being hirsute, but with the slightly conspicuous stigmatic series of

Vernoniaceæ, is not only constant in the tribe of 33 genera and above 700 species (although slightly modified in *Mikania*, where it is less obtuse and more slender), but is also, I believe, exclusive, or there is only a slight approach to it in a few Inuloideæ or Mutisiaceæ. The *Asteroid* style (fig. 4), with flattened branches, the marginal stigmatic series very prominent but not reaching the extremity, which consists of a so-called appendage, long or short, broad or narrow, acute or obtuse, and papillose or shortly hirsute all over, is very prevalent in the tribe as now limited; but occasionally the appendage is so short as to bring the style nearly to that of the Senecionideæ or of the Inuloideæ, and sometimes a truly *Asteroid* style, as well as numerous approaches to it, may be observed in various genera of Helianthoideæ, Helenioideæ, and Senecionideæ. The *Inula* style (fig. 7), with the stigmatic series reaching to the end of the branches, or nearly so, without appendages as in *Senecio*, but the branches rounded, not truncate, at the end, prevails in several subtribes of Inuloideæ, but in others passes into the true *Senecio* style. It is also to be occasionally met with in Arctotideæ and Mutisiaceæ, as well as in genera closely allied to *Senecio*. The *Senecio* style (fig. 6) has flattened branches like that of *Aster*, but narrower and usually recurved; and the stigmatic series reach the extremity, which is truncate and fringed with hairs. This style is uniform in nearly the whole of the 900 species of *Senecio* and in several allied genera; but even in *Senecio* itself the extremities of the branches are occasionally rounded, or form an exceedingly short appendage (in this tribe called cone), which, in other genera very closely allied to *Senecio*, lengthens out (as in fig. 5) even into the *Vernonia* form (fig. 2), the stigmatic series also gradually becoming less conspicuous; and the true *Senecio* style is observable in numerous genera which on other accounts must be placed in Inuloideæ, Helianthoideæ, Helenioideæ, Anthemideæ, or Mutisiaceæ (Nassavieæ). The *Carduus* style (fig. 8), with a so-called articulation or change of texture, and abrupt thickening or ring of hairs, above the middle, at or usually much below the branching, the branches, if long, erect, but usually very short and erect or spreading, is general, but not universal, in Cynaroideæ, and is also observable in some genera of Mutisiaceæ and Arctotideæ. In all tribes which admit of central sterile hermaphrodite florets (Asteroideæ, Inuloideæ, Helianthoideæ, Helenioideæ, Anthemideæ, Senecionideæ, Calendulaceæ, and Arctotideæ) the styles of these sterile florets are for the most part filiform or slightly clavate, undivided or with slender erect branches, very papillose or hirsute outside, without stigmatic series inside, and very similar in all the different tribes where they occur. The Cichoriaceous style (fig. 1), with slender, almost filiform, papillose branches, varying but slightly in being more or less acute or obtuse, and very rarely somewhat shortened and flattened, is uniform in the tribe, but is also precisely the one most general in the female florets of the order.

To recapitulate, the style-branches of the hermaphrodite florets afford one of the most useful characters for the determination of genera and some tribes; but all attempts to take it as absolute have hitherto miserably failed, and it must always be considered in combination with other characters.

An increase in the number of style-branches from two to three has been occasionally observed, but appears never to be even of specific importance; for I have met with it in genera otherwise far removed from each other, and never found it to be constant in all the flowers of the same specimen.

The epigynous disk has been much made use of for the distinction of genera, by a few botanists who have specially studied a small number of Composite forms. When present it varies much in form: generally speaking, it is a fleshy or glandular, thick, annular projection round the base of the style, either free from it or more or less connected with it, and passing, as it were, into a bulbiform base to the style itself, besides other modifications. In some *Centaureæ*, for instance, it forms a membranous or paleaceous 5-toothed cup or tube, having the appearance of an inner pappus; in many genera there is no trace of it. I had formerly, in concurrence with Steetz, Schultz Bipontinus, and others, thought that these differences might be useful at least for generic distinction; but when I came to observe it in several large natural genera, I found it so variable, that I felt compelled to omit it from the generic characters whilst unable to verify it in every species. Delpino connects the presence or absence of the epigynous disk with the entomophilous or anemophilous character of the fertilization; and he may be right, although the observations hitherto made are far too few to assume such to be the case; and even if it be so, the character seems of comparatively inferior systematic value, entomophilous and anemophilous fertilization occurring sometimes, in Compositæ as in other orders, in plants otherwise closely allied—as well stated by Delpino in the above-quoted pamphlet, p. 34, almost in contradiction to the generic and even tribual importance he attaches to the character in the same memoir.

4. *Differences in the Fruit*, i. e. *in the Achene and its Pappus*.

The fruit, which in many large and natural orders, such as Leguminosæ, Umbelliferæ, Rubiaceæ, Myrtaceæ, &c., has furnished many valuable characters for the distinction of genera or tribes, has naturally been looked to for similar purposes in Compositæ; and Schultz Bipontinus, for instance, has prided himself on establishing his genera on carpological principles. But throughout this vast order, so far as the achene itself is concerned, the structure is absolutely the same; there remain only outward form and consistence, which, however useful in the case of many genera, are, if too closely relied upon, apt in Compositæ, as in Leguminosæ and others, to break up very natural genera, especially when the modifications are the result of development in the course of growth from the ovary, and not discernible at the period of fertilization of the flower. The achene (always without its pappus) is very rarely of any use in determining the tribe of a Composite plant, beyond a few vague forms appreciable perhaps to the eye, though difficult to describe, which are only to be found in some one or two of the thirteen tribes; and, moreover, there are so large a number of species in which the ripe fully formed achene is as yet unknown, that its absolute value in large genera where it is usually so uniform, such as *Vernonia*, *Aster*, *Senecio*, &c., is as yet very doubtful. Outward form, however, when ripe achenes are obtainable, is so prominent a character that much use has been made of it, and often to great advantage, in the definition of genera otherwise natural, and sometimes for that of subtribes or smaller groups of genera.

The principal modifications are:—(1) the shape acquired in lateral development, (2) in longitudinal development, (3) the development of the ribs, (4) the consistence, (5) the surface and indumentum.

In lateral development the achene as it ripens becomes angular, terete, or flattened, with a considerable degree of constancy in genera or even in subtribes, although in some cases, where it has been the most relied upon for the separation of large nearly allied genera (as in Asteroideæ, for instance), there are usually a few exceptional or intermediate species which forbid any absolute reliance upon it. When flattened it becomes important, as in Umbelliferæ, to consider whether the flattening is lateral (that is, in the direction of the radius of the flower-head) or dorsal (that is, at right angles to the radius); this forms a good distinction, for instance, between the subtribes Verbesineæ and Coreopsidæ of Helianthoideæ. This character, however, applies only to the achenes of the disk; those of the outer row, even when the others are laterally flattened, are often dorsally so, or, if the inner edge protrudes, they become triquetrous.

In longitudinal development the achene is either equally grown at both ends, so as (if terete) to form a regular cylinder, or tapers at the upper end beyond the seed into what was formerly called a stipes to the pappus, but is now recognized as a neck or beak to the achene, or tapers at the lower end into more or less of a stipes, all which forms variously combined, being readily observed (if ripe achenes are obtained), have been made great use of in the fixation of genera or even of subtribes, especially in Cichoriaceæ; but one of the most prominent differences, between the achene merely contracted at the top, and the distinctly beaked achene, has now been generally abandoned in such genera as *Crepis*, *Leontodon*, &c., where there occurs every grade from the one to the other; and in many genera, of which it is still the most marked character, it is necessary to be very cautious in its use.

The development of the ribs of the achene would at first sight seem to hold the same position in the classification of Compositæ as in that of Umbelliferæ, the ribs being precisely of the same nature; they represent the ribs or nerves of the calycine leaves which form the adnate calyx-tube; their systematic value, however, is more varied in Compositæ than in Umbelliferæ. These ribs are equal to the number of the calycine leaves (usually 5, or sometimes 4) when the primary nerve alone or midrib of each leaf is prominent, double that number when an intermediate rib is formed between each two by the combination of the lateral nerves of each two adjoining calycine leaves, three times (15–12) if these lateral nerves are separately developed, four or more times if four or more parallel veins are developed from each leaf. This distinction between the development and non-development of the secondary ribs has been found constant, as far as hitherto observed, for the separation of the two principal subtribes of Eupatoriaceæ, but has quite failed, even for genera, in Vernoniaceæ. In other cases the reduction of the ribs to the two marginal ones of flattened achenes, the protrusion of one, two, three, or more of the primary ribs into acute angles, or their expansion into wings, or their regular equidistance, or the contraction of some of the intervals between them, are often the characters of good genera, but have in many instances (as in *Chrysanthemum*) been too much relied upon, producing generic combinations or disseverances far from natural.

The consistence of the ripe achene is occasionally, but rarely, useful as a generic character. The thick achene, whether hard and bony or fleshy, is only to be met with in Cynaroideæ, Arctotideæ, Calendulaceæ (*Osteospermum*), and a few Helianthoideæ; but even there, although pretty constant in genera, is unavailable for tribual or even subtribual distinctions. The pericarp is never, I believe, truly crustaceous and fragile, but from the ordinary consistence it passes in a few genera into thinly membranous. The smooth pitted or muricate surface has been made use of in the case of some Cichoriaceæ especially, but cannot be implicitly relied on. In some genera of Helianthoideæ, for instance, as also in *Villanova*, *Adenostemma*, *Brachycome*, and some others, strongly muricate and perfectly smooth achenes are met with in different capitula of the same specimen, or proceeding from different florets of one and the same capitulum. The difference between the densely silky-hairy and the glabrous or slightly hirsute achene, and in some cases the woolly indumentum, has been found a good generic character in some Helenioideæ, Cynaroideæ, Arctotideæ, Mutisiaceæ, and Cichoriaceæ.

The pappus may be best considered under the head of the fruit; for although homologically it is generally admitted to be an altered or semiabortive calyx-limb, and although when present it is always already to be met with at the time of flowering, yet it is on the ripe achene that it has attained its fullest development in those innumerable variations which strike the eye of the most superficial observer, and which have been eagerly seized upon to characterize a large proportion of the thousand and one petty genera with which synantherology has been encumbered. Constant or nearly so in each species, with very few exceptions, the pappus will often, in a most natural genus, so vary from species to species, as to make it a most difficult task to decide whether it should be neglected altogether, or, if taken into account, what modifications may be taken as generic, subtribual, or tribual.

The presence or absence of a pappus or its degree of development is always of much less importance than its nature when present; for there are frequently exceptional species or varieties where it is wanting in genera or species where it is usually present; and therefore it is, that where we have a specimen with no pappus, we must be very careful to determine its affinities by other characters. In some cases, however, the absence of pappus has proved a really constant generic character, and is often a clue at least to the tribe of a Composite. It is, for instance, almost always present in Senecionidæ, and very frequently deficient in Anthemideæ. There is not, however, a single tribe in which there is not at least one genus deprived of all pappus.

Among the various peculiarities by which the pappus is diversified, it is a very difficult question to determine which are and which are not of importance in classification, whether we reason *à priori* from the presumed homology and functions of the organ, or whether we confine ourselves to the experience of its conformity or non-conformity to variations of other organs. As a general rule, the greater the consolidation and contraction of the inner and more important floral organs, and the more the outer comparatively vegetative organs are called in to assist in some part of the reproductive functions, the more constant and important in classification are the latter. In Compositæ we have alluded to the great condensation of the floral organs; and, amongst other reductions, the calyx-limb, in the form of a pappus, appears to have its functions annihilated or confined to the sole purpose of assisting in the dissemination of the seed, whilst its ordinary part of protecting the young flower is here supplied by the bracts collected in an involucre. The modifications under which this pappus is acted on by wind, or adheres to extraneous substances, ought therefore to be systematically important, as well as those which are indications of its homologies. On the other hand, the pappus being in so many cases a very much reduced or rudimentary organ, those differences depending on the degree of development must, as in the case of other rudimentary organs, be very little relied on.

Of these modifications, we may first consider the indications of homologies. If the pappus is a reduced calyx-limb, then in all cases where it consists of a single ring of bristles or paleæ it is easy to suppose that these may represent the parallel veins, nerves, or ribs of the calyx-lobes or calycine leaves—more especially as they, or at least the most valid among their number, often correspond in number, and are even in direct continuation of the ribs of the achene; but where these bristles are very numerous and crowded in a dense tuft, scarcely separable into series, or where they form several concentric series, very distinct from each other and often differing in nature, their homology is not so easy to settle. Most probably the longest or principal series represent the calyx-ribs, which may sometimes, owing to their great number and crowded state, become forced, as it were, into two or three apparent series, when they are organically in a single one; and these, therefore, should be taken chiefly into account in using the pappus as a systematic character. The gradually diminishing outer rows, so much less constant in their presence, absence, shape, or degree of development than the principal row, may be analogous only to those extra teeth or appendages of some Melastomaceæ, Verbenaceæ, &c., which have been called epicalyces. The occasionally present reduced innermost row (as in some *Centaureas*), which, as above mentioned, may be only a modification of the epigynous disk, is of scarcely more than specific value.

The four principal modifications of the pappus which may be made available in the tribual characters are:—1, the *setose* pappus, where the ring consists of a number, often indefinite, of bristle-like rays, sometimes very slender and hair-like, sometimes thicker or flattened and passing into paleæ; 2, the *paleaceous* pappus, consisting of a usually smaller and often definite number of flattened chaff-like or transparent scales; 3, the *aristiform* pappus, where one, two, three, or more of the ribs of the achene are produced into rigid awns or teeth; and, 4, the *coroniform* pappus, where the very short paleæ are united in a ring or cup. These different forms give very useful and general characters without being absolute; for in every tribe there are exceptions to the normal pappus, besides that the different forms may pass so gradually one into the other as to make it difficult to decide to which class a given pappus should be referred. The paleæ may be very obtuse or produced into a point which may lengthen into an awn, whilst the flattened base may gradually shorten or be obliterated, or the paleæ may gradually increase in number and diminish in breadth, till they come better under the designation of setæ, or they may gradually shorten and unite more or less into a corona. Generally speaking, the pappus may be said to be setose or slightly paleaceous in Vernoniaceæ, Eupatoriaceæ, Asteroideæ, and most subtribes of Inuloideæ; aristiform or truly paleaceous in the subtribe Buphthalmeæ of Inuloideæ and in Helianthoideæ, paleaceous in Helenioideæ, coroniform or none in Anthemideæ, setose again in Senecionideæ, none in Calendulaceæ, paleaceous or none in Arctotideæ, setose or slightly paleaceous and usually very copious in Cynaroideæ, setose or paleaceous in Mutisiaceæ and Cichoriaceæ. In all tribes there are a few genera or species, and in Asteroideæ, Inuloideæ, Helianthoideæ, and Helenioideæ several genera without any pappus; and in almost all tribes there are a very few striking exceptions to the normal form, although perhaps specific only.

Of the further modifications of the pappus, there is one upon which great stress is often laid, as being of supposed absolute generic importance—the difference between the simply setose (where the setæ are denticulate or scabrous only) and the plumose (where the setæ are bordered by fine cilia like the plumes of a feather). But the value of this character has been much overrated. The plumose pappus occurs most frequently in Cichoriaceæ, Mutisiaceæ, and Cynaroideæ; in the two former tribes it is often constant in otherwise good genera; in Cynaroideæ it is also not uncommon, but rarely accompanied by other marked differences; it is little more than a specific character in *Onopordon*, *Jurinea*, *Tricholepis*, *Centaurea*, &c.; and if we have maintained it for the technical separation of *Cnicus* from *Carduus*, it is partly from convenience, on account of the large number of species it separates—partly on geographical grounds; for the American species, which are now numerous and pass into a distinct type in other respects, have always the pappus plumose. In the other tribes the plumose pappus is rare, occasionally constant in small but natural genera, in other instances passing gradually through allied species into the simply setose. The difference is indeed but one of degree; the lateral denticulations or cilia are always the same in relative position. When they are shorter than the diameter of the pappus-ray or main seta, the latter is termed simply scabrous or denticulate, when they shortly exceed that diameter it is said to be barbellate, and plumose only when they are considerably longer. The intermediate barbellate stage, however, is much more rare than the simply denticulate or the decidedly plumose state.

Another distinction often of some importance, and much insisted upon of late, especially by Weddell, is, in those very frequent cases where the setose pappus parts with its achene—whether it falls off altogether, the setæ being united in a ring at the base, or whether each seta falls off separately. This character is often of much avail in several genera of Cichoriaceæ; and Weddell made use of it chiefly in aid of the difficult discrimination of some Gnaphalioid genera or subgenera, and at first sight very successfully; but a closer investigation of a much larger number of species than he had at his command has in some measure lowered again the supposed value of the character.

Generally speaking, the modifications of the pappus, however inconstant in genera or even sections, are very constant in species; the exceptions are chiefly in the coroniform and other very much reduced pappi, which may be present or absent in different individuals or varieties of one and the same species—as, for instance, in those forms of *Chrysanthemum leucanthemum* so elaborately worked out by Fenzl, as well as in several *Matricariæ* and some species of *Centaurea*, several Helenioideæ, &c.

5. *Differences in the Andrœcium.*

In all essential points the andrœcium of Compositæ is as uniform throughout the order as the pistil; it offers none of those differences in number, symmetry, position, direction, or structure which in so many orders are called in aid of the discrimination of genera. The anthers, equal in number to the corolla-lobes, are united, or perhaps, in a few cases, only closely connivent in a cylinder round the style, and their cells open inwardly and longitudinally without any variation; so also in regard to the filaments, they are always inserted in (adnate to) the corolla-tube, and attached to the base of the connective. These filaments vary slightly in the height to which they are adnate to the corolla-tube (a question of degree affording no available characters), and also in their being free or monadelphous after quitting the tube, and glabrous or papillose-hairy. Both the latter characters have been made use of in Cynaroideæ as generic—the former to separate rather too artificially three monotypic genera from *Carduus* and *Cnicus*, the hairy or non-hairy filaments rather more successfully applied to the distinction of a few large genera where it proves constant. There is also, in many Senecionideæ, for instance, an abrupt dilatation or change of texture, and almost an articulation at some little distance below the insertion of the anther. But it remains to be ascertained how far this is constant even in the genus *Senecio*; and my own observations are insufficient to establish it as a generic character.

The anthers, however, are sometimes provided with certain appendages apparently of little or no functional or homological importance, but which nevertheless, from the remarkable constancy of their presence or absence in whole tribes, supply one of the most valuable characters in Compositæ if applied with proper caution. These appendages are either apical or basal. At the top of the anther-tube each connective is produced into a thinly cartilaginous erect or incurved membrane or point, which may possibly act some part in influencing the dissemination of the pollen, although nothing in that respect has as yet been ascertained. These appendages are uniform throughout the order, except as to length or breadth, and except as to two subtribes which they assist in characterizing. In the subtribe *Piquerieæ* of Eupatoriaceæ they are deficient, the anthers being truncate on the top; and in the subtribe *Ambrosieæ* of Helianthoideæ they taper into an incurved point. In one or perhaps a very few species of Helianthoideæ, they are reduced to a small point or possibly deficient.

At the base of the anthers the appendages usually called tails are much more systematically valuable, as affording by their presence or absence almost absolute tests of several of the largest tribes. The difficulty is, in a few cases, to decide whether the anthers are or are not to be properly designated as tailed; and allowance must be made for a few, although rare, real exceptions.

First, as to determining what is a tail to an anther, the accompanying figures (Plate IX.) will readily explain the principal differences. In figs. 1 and 2 the anthers are truncate at the base; in fig. 3 produced into obtuse auricles; in fig. 4 sagittate with the auricles of adjoining anthers connate to the point, in fig. 5 sagittate with the auricles free; and in all these they are inappendiculate or tailless, although the auricles in figs. 4 and 5 may be very acute, for the points are not produced beyond the pollen-bearing cells; in figs. 6 and 7 these auricles, united in fig. 6, distinct in fig. 7, are very shortly produced into what may be termed rudimentary tails, and occasion one of the great difficulties, as different botanists have described them as tailed or tailless; in figs. 8 and 9 the tails are decidedly setiform, those of adjoining anthers united so as to show five setæ to the pentamerous andrœcium in fig. 8; setiform but distinct in fig. 9, showing ten setæ either approximate in pairs or equidistant as represented in the plate, or lying close to the filament; the tails are ciliate at the end or ciliately fringed in figs. 9 and 10, dilated and fringed in fig. 11. But the observation of some of these differences requires considerable care and some experience. If not well soaked out, the acute auricles of figs. 4 and 5 may be mistaken for the really pointed ones of figs. 6 and 7; and the tails of fig. 7, and even of fig. 9, sometimes lie so close to the filament, that when very fine they are frequently overlooked. To show the degree of constancy of these various forms we may take the thirteen tribes in succession, as far as known; and I may state that there are very few genera in which I have not examined the anthers, and usually verified them in a considerable number of species of the larger genera.

Vernoniaceæ (near 500 species in 35 genera) have normally the anthers of figs. 3, 4, or 5, and strictly so in the great majority of species. They are, therefore, usually characterized as tailless; but there are some four or five genera, one of at least twenty species, the others monotypic or nearly so, which pass into fig. 7, and have therefore been described as exceptionally tailed, although they never, as far as I am aware, have the elongated setiform or fringed appendages of figs. 8, 9, and 10. Several species of *Vernonia* itself have also been described as having shortly tailed anthers; but that is owing to careless observation of the acute auricles not sufficiently soaked out so as to show that they are polliniferous to the end. Vernoniaceæ, therefore, may be safely characterized as having the anthers sagittate at the base, with the auricles obtuse, acute, or rarely produced into short points.

Eupatoriaceæ (above 700 species in 35 genera) have the anthers of fig. 1 and 2, passing occasionally into fig. 3, but never, as far as I am aware, beyond that, and are therefore characterized as having the anthers truncate, emarginate, or rarely sagittate at the base, and strictly tailless.

Asteroideæ (nearly 1500 species in 88 genera) have the anthers as strictly tailless (varying only from truncate to sagittate) as in Eupatoriaceæ, with the exception of some very few, perhaps not above a dozen, species of Australasian *Olearias* and *Celmisias*, in which the auricles have been observed to have minute very fine points, similar to the tails of figs. 7 and 8 when in a reduced form. In these rare cases the other tribual characters are so decided as to leave no doubt as to the tribe to which the plant should be referred.

Inuloideæ (above 1100 species in 138 genera) have the tailed anthers of figs. 6 to 10, not absolutely without exception; but having myself examined all the genera, except six monotypic ones unknown to me, and by far the greatest number of species, I have only found the few species of *Laggera*, three or four of *Phagnalon*, and perhaps as many more scattered over other genera in which these tails are wanting. There are, however, many species, especially among the Gnaphalioid genera, in which they are so fine, and so apt when wet to lie close to the filament, as to be difficult to observe, besides that they have been neglected or carelessly overlooked in the characters given by authors to various genera, which have therefore been placed in wrong tribes. In all these doubtful cases there are characters derived from the style and other organs ready to be called in aid.

Helianthoideæ (nearly 1100 species in 140 genera) vary in their anthers as in their styles. Like the Vernoniaceæ, the base of the anthers passes from fig. 2 to fig. 7, but never beyond that; they are usually sagittate with obtuse, acute, or more or less pointed-acuminate auricles, but not properly speaking tailed, although they are on some occasions so described by Grisebach and some others. They are often also as obtusely truncate at the base as the Eupatoriaceæ.

Helenioideæ (nearly 300 species in 60 genera) are, in respect of anther-bases, like Helianthoideæ, but with less variation, ranging from fig. 2 to fig. 5, rarely if ever passing into figs. 6 or 7.

Anthemideæ (about 650 species in 41 genera) appear to be always quite tailless, and show more frequently fig. 2 than figs. 3, 4, or 5, and never, as far as I am aware, go beyond that.

Senecionidæ (about 1350 species in 42 genera) have again the range of Helianthoideæ in their anther-bases, which are almost always sagittate from fig. 3 to fig. 5, rarely truncate as in fig. 2, or shortly pointed as in figs. 6 or 7, never, properly speaking, tailed as in figs. 8 to 10; but, as in the case of Helianthoideæ, some of them are occasionally described as tailed.

Calendulaceæ, the smallest of all the tribes (not quite 120 species in 8 genera), is less definite than any in respect of the anther-tails, which are more or less decided from fig. 6 to fig. 8, rarely so obsolete as to show figs. 4 or 5, nor yet so prominent or fringed as to represent figs. 9 or 10.

Arctotideæ (about 250 species in 16 genera), usually connected with Cynaroideæ on account of their styles, but more nearly allied to Anthemideæ in their involucres and flowers, show an approach to the latter tribe in their anther-bases, which are never more tailed than in figs. 6 and 7, and usually ranging from figs. 2 to 5.

Cynaroideæ (nearly 900 species in 36 genera) belong essentially to the tailed-anthered division. Their tails are usually long and fringed, as in figs. 9 and 10, or dilated as in fig. 11; but there are exceptions. In most *Serratulas*, and in some species of *Xeranthemum*, *Centaurea*, and a few others, the tails are more and more shortened or quite obsolete; but these exceptional species have other characters which leave no doubt as to their affinities, and after all they are but very few in proportion to the number of species in the tribe.

Mutisiaceæ (about 450 species in 49 genera) belong also to the tailed class, showing the anther-bases of figs. 8 to 10, without any gradual reduction of the tails as in Cynaroideæ, but with two remarkable exceptions. *Schlechtendahlia* and *Barnadesia* have no tails at all, even rudimentary, to their anthers. The former, a single anomalous species, may possibly hereafter be connected with some other tribe; but the ten species of *Barnadesia* are so decidedly Mutisiaceous in every other respect, that they must be accepted as a striking exception.

Lastly, Cichoriaceæ (above 700 species in 56 genera) are as uniform in their anthers as in their styles and corollas, although there may be some ambiguity as to the class of anther-bases to which they should be referred. They have been described as tailed and as tailless; and after examining hundreds of species either in the dry or in the fresh state, I have been left in doubt as to which is the best designation. The anthers are always sagittate at the base with pointed auricles; but how far the fine point is produced beyond the end of the cells is a matter of uncertainty; it is generally so produced, although never to any considerable length, and seems to vary in that respect (within very narrow limits) in one and the same species; but these niceties are difficult to appreciate, and I may not always have been sufficiently careful in my dissections.

There are some other differences in the anthers, such as the proportion occupied by the polliniferous portion, the degree in which the anther-tube is exserted from or included in the corolla-tube, &c., in which I have been hitherto unable to discover any good generic indications. Steetz and some others have also established genera on characters derived solely from the shape of the pollen-grains; but this character has been accurately observed in by far too small a number of species to be as yet made available for systematic purposes. It would require the close observation and study of years to decide upon its value; and if really sufficiently connected with other characters to establish it as a natural one, it never would practically be very useful, as requiring a high microscopical power to verify it. It has been generally said that the pollen is angular (usually dodecaedrous) and scabrous in Cichoriaceæ, globular or elliptical and smooth in Mutisiaceæ, globular and echinulate in the remaining tribes ; but several exceptional genera or species have already been noted, which, if they had been confined to genera otherwise anomalous, such as *Stokesia*, might have tended to establish the value of the character. But Steetz has also separated, on this character alone, plants which are, on every other account, evidently congeners ; and it remains to be observed whether some of the differences noted may not be individual only or even dependent on age or degree of development.

The presence or absence of staminodia, or abortive or imperfect stamens in the female florets, has been regarded as a character of some importance ; and it is, in a few cases, perhaps generic, but never much to be relied on. These staminodia are frequently to be met with, and perhaps constant in some genera, in Mutisiaceæ, in Petrobieæ, and a few other Helianthoideæ, and a very few Senecionideæ, rare, if ever observed, in Asteroideæ, Inuloideæ (except one or two species of Buphthalmeæ), Helenioideæ, and Anthemideæ.

6. *Differences in the Corolla.*

The corolla of Compositæ is superior and gamopetalous, with a valvate æstivation throughout the order with as much uniformity as has been observed in the essential characters of the andrœcium and pistil. It is usually pentamerous, but not unfrequently tetramerous, and occasionally trimerous—differences which are sometimes generic, frequently specific or sexual only, or variable in the same species, never tribual. The available differences consist in the varied development of the limb, whether regular or irregular.

The first and most obvious distinction which strikes the eye of the most careless observer is that between the tubular and the ligulate limb, giving three principal forms of flower-heads—the discoid (where the corollas of all the florets are tubular), the radiate (where the external ones are ligulate and the central ones tubular), and the liguliform (where all the corollas are ligulate). But on further investigation this distribution requires to be modified. The ligulate corollas of the Cichoriaceæ do not correspond to those of the ray in other tribes. In the Cichoriaceæ, or true Liguliforæ, the ligula is 5-merous ; it consists of the whole of the five united petals forming a flattened lamina, truncate and shortly 5-toothed at the end (Plate VIII. fig. 1), and this with the utmost uniformity throughout the tribe ; whilst in all other Compositæ, collectively distinguished by Weddell and others as Tubulifloræ, when the florets of the circumference, or, in a few cases, all or nearly all are ligulate, the ligula is trimerous only, consisting of three only of the united petals, the two inner ones being reduced to minute teeth, or, more generally, entirely deficient (fig. 7). The only instances among Tubulifloræ of an approach to the Cichoriaceous corolla are in *Stokesia*, a monotypic genus of Vernoniaceæ, where the corollas are irregularly expanded into a 5-lobed lamina, and in a very few Mutisiaceæ and two or three species of Cynaroideæ, where the lamina is 4-merous, or even, in a few species, 5-merous, almost as equally so as in Cichoriaceæ. In Cichoriaceæ, therefore, the corolla gives us an absolute tribual character, but no generic ones within the tribe, beyond a few indications derived from size or colour. It is the diversity in the corolla of Tubulifloræ alone that we have further to consider.

The corollas of the female florets always differ from the hermaphrodite ones of the same species, sometimes only in being more slender, very frequently in the shape of the limb; and, in so far as the difference is owing to sex alone, the characters to be derived from the presence or absence and relative number and position of these diverging forms have been already considered under the head of sexual differences; but there are other diversities of form to which some importance is attached. The most remarkable is the so-called bilabiate form of most Mutisiaceæ, which had induced many to class that tribe as a distinct suborder, under the name of Labiatifloræ. In that tribe there is in the same head, or in different species or genera, a gradual passage from the regular 5-lobed to the ligulate limb:—first, a slight irregularity, owing to the innermost lobe being more deeply separated than the others; then two of the inner ones are more deeply separated or more erect than the three outer ones (Plate VIII. fig. 5); then, again, the two inner ones shorten, whilst the three outer lengthen and become gradually consolidated into a ligula; sometimes the two inner and three outer ones are respectively united, the former into a short inner lip, the latter into a longer outer one (fig. 6), or the inner lobes disappear altogether, leaving the truly ligulate trimerous female corolla of ordinary radiate heads (fig. 7). All these forms are to be met with in Mutisiaceæ, which can therefore no longer be absolutely characterized by their corollas. In the subtribe *Gochnatieæ*, for instance, they are all tubuliform, and as regular as in any discoid genus or tribe; and although the well-developed bilabiate form is almost limited to Mutisiaceæ, yet there are a few genera among radiate Senecionideæ or Inuloideæ, and perhaps some others, where the ray-florets have at the base of their lamina one or two small inner lobes.

In other respects the form of the florets may afford some slight indication of the genera or tribes. Long narrow corolla-lobes to the hermaphrodite regular floret (fig. 4) are characteristic of most Vernoniaceæ and Cynaroideæ, rare in Asteroideæ, Inuloideæ, Helianthoideæ, and Senecionideæ. The female florets when present are almost always slender, but regular or nearly so (fig. 8) in some genera or subtribes of Asteroideæ, Inuloideæ, Anthemideæ, and Senecionideæ, always ligulate (fig. 7) in others. In a few genera or sections of genera of Asteroideæ, and in one of Mutisiaceæ, the outer rows of female florets are ligulate, the inner filiform; and in some genera or subgenera of Helianthoideæ or Anthemideæ the female florets have only a rudimentary corolla, or are absolutely without any. In all these respects differences in form of the corolla are more important than its absolute presence or absence, or than the degree of development when present.

The general shape of the limb (that is, of the dilated portion above the insertion of the stamens) of the regular corolla, whether campanulate (fig. 3) or gradually dilated, or scarcely thicker than the tube and cylindrical (fig. 2), is sometimes characteristic of genera, but very frequently specific only. Colour is also, in some measure, characteristic of some tribes. The corollas are, I believe, never yellow in Vernoniaceæ or Eupatoriaceæ, and not very frequently so in Cynaroideæ, in all of which the prevailing colour is purplish, varying from pink to blue, although pure blue is not frequent. In Cichoriaceæ yellow is the common colour, although some species, groups of species, or even genera are blue; pink and purple rare. In all the other tribes yellow is the prevailing and, in some tribes, the constant colour in the hermaphrodite florets; pink, purple, and blue exceptional, the latter very rare. The female florets when expanded into a ray are either of the colour of the disk, or pink, purple, blue, or white, with a yellow disk. This distinction between homochromous and heterochromous flower-heads, although specific only in some genera, *e. g. Senecio*, is generic in Asteroideæ, where it has served indeed to characterize two of the subdivisions of the tribe—somewhat artificial ones it is true, but yet the best that have been proposed. White flowers are not common in the order, but are to be met with in all the tribes, whether the normal colour be yellow or not; they have even been made to serve as a generic character to distinguish *Cacalia* from *Senecio*, and *Nabalus* from *Prenanthes*. This, however, only holds good for North-American species.

The constancy of the venation of the corolla-lobes in Compositæ pointed out by Brown has since been frequently alluded to, and is, as it were, the natural consequence of the equally constant valvate æstivation. The chief minor difference observable in venation is in the undivided part of the limb, and results from the prominence of the central vein alone of each petal, or from the more or less conspicuousness of the lateral veins, those of two adjoining petals combined into one, or distinct, and all similar to the central vein. The latter arrangement is conspicuous, for instance, in the ligulæ of *Trichocline*, and comes in aid of the generic character.

7. *Differences in the Calyx.*

The calyx in Compositæ is so absolutely deprived of its ordinary function (the protection of the young flower), so completely absorbed in the ovary, or so absolutely rudimentary at the time of flowering, that the only available distinctive characters it affords result from the varied impress it gives to the external surface of the fruit, or from the forms it acquires as a portion of that fruit. These characters, therefore, have been considered under the head of the fruit, as those of its ribs and pappus.

8. *Differences in the Ultimate Inflorescence and Bracts (the Capitulum, its Receptacle, Involucre, and Paleæ).*

Inflorescence and its bracts are most frequently classed among the vegetative organs, and consequently assigned a low grade in the scale of generic characters, too low a one, probably, in many cases. In Compositæ, however, where they are called upon to take a part as accessories to the reproductive operation, to supply in some respects, the place of some of the reproductive class that have been disabled by consolidation, they acquire an unwonted degree of fixity, and thence of generic value. Thus it is, that the diversities in the flower-head or capitulum, its involucre, receptacle, and paleæ, are properly taken account of in the essential character of every genus of the order.

Whatever be the primary inflorescence of Compositæ (solitary, cymose, paniculate, capitate, or any other form), the ultimate ramification is invariably a capitulum—several flowers (often very many, sometimes very few, or a single one) sessile, or nearly so, on a common receptacle, within an involucre of several, often very many, rarely only two or three, closely packed bracts, which act more or less the part of the suppressed calyces in protecting the buds or the young fruits. Notwithstanding the special names given to these organs by various synantherologists, there is nothing to distinguish them from the corresponding organs in divers genera of Dipsaceæ, Umbelliferæ, Cornaceæ, Myrtaceæ (*Darwinia*), Proteaceæ, Thymeleæ, and many others—nothing whatever except their constancy. In order correctly to understand the minor modifications to which these organs are subject, it is necessary to keep their homology in view; and therefore it is that we have thought it better to retain the intelligible terminology of *involucral bracts* and *receptacle*, than to encumber it with such special terms as *periclinium*, *phyllaries*, *clinanthium*, &c., which only serve to give unnecessary trouble and convey false notions.

The capitulum characterized by the involucre exists throughout the order; the involucre may in some compact compound inflorescences be reduced to two or three bracts only, never, I believe, to a single one, even when uniflorous. The number (taken generally within certain limits, rarely as absolutely precise) and arrangement of the bracts, their general form and consistency, and the general form the involucre itself or the capitulum (including the florets) assumes, afford generic characters in most cases excellent from their constancy, although, from their ready perceptibility and the aspect they give to the plant, they are apt to be too hastily observed and too implicitly relied upon. They are also far from absolute as tribual characters, although they may give good general indications. Thus the single row of inner equal erect involucral bracts, with or without much smaller or differently shaped or much looser outer ones, so common in Senecionideæ, Helenioideæ, and Helianthoideæ, are seldom, if ever, to be met with in Vernoniaceæ, Eupatoriaceæ, Asteroideæ, Inuloideæ, Anthemideæ, Arctotideæ, or Cynaroideæ. The ovoid or globular involucre with many rows of closely imbricate bracts is chiefly characteristic of Vernoniaceæ, Cynaroideæ, the subtribe Gorterieæ of Arctotideæ, a portion of Mutisiaceæ, and exists only in isolated genera in other tribes. The broadly hemispherical involucre with scarious-tipped or bordered inner bracts is general in Anthemideæ, in the subtribe Euarctoteæ of Arctotideæ, and in some Asteroideæ. Involucres, however, are sometimes deceptive, and precisely the same forms may be occasionally met with in two genera belonging to widely distant tribes.

The receptacle, which is homologically the dilated apex of the peduncle, has in its general shape (concave, flat, convex, conical, or elongated) occasionally supplied generic characters, rarely of much value, and sometimes deceptive. Where the involucral bracts have been in many rows and very deciduous, they leave after falling off an apparently ovoid, obovoid, turbinate, or obconical receptacle, which has been used generically to separate species from their allies described as having flat or convex receptacles, when really there has been no difference at all, except that in the one case the portion of the peduncle on which the bracts had rested is taken into account, and in the other the apex only within the bracts has been considered. The extreme forms of the receptacle, either concave or elongated into the rhachis of a cylindrical spike, have been on some rare occasions observed in single species, which have on that account been at once raised into monotypic genera; but I do not believe that these differences have ever been found accompanied by other peculiarities, or to be prevalent through two or more otherwise allied species, and must therefore be regarded as specific only.

The so-called paleæ of the receptacle within the involucre have been made great use of, by their presence or absence, for characterizing genera, subtribes, or even tribes. But this use, however appropriately adopted in some cases, has in others degenerated into abuse. Homologically, these paleæ are the same as the involucral bracts. There is not even the difference that lies between ordinary bracts and bracteoles, for both are on the same axis, but is solely that which distinguishes the lower empty bracts of an ordinary spike or other simple inflorescence from those which subtend the individual flowers. In Compositæ, however, these inner subtending bracts amongst the florets are so frequently different from the outer empty or involucral ones in form, size, consistence, constancy, &c., that their designation by the distinct name of *paleæ* is of great convenience in systematic descriptions.

There is sometimes, however, a difficulty in regard to the innermost row of outer bracts, either when these are gradually modified so as to pass, as it were, into the flowering bracts or paleæ, or when each one of that innermost row of outer bracts exactly subtends one of the florets of the outermost row, or even embraces or encloses it, and is then different in form &c. both from the outer involucral bracts and from the inner paleæ; and some controversy has been carried on as to whether this is an inner row of involucral bracts or an outer row of receptacular paleæ. But this is a mere war of words. Homologically the two are one and the same thing; but, as a matter of convenience in description, it has been a general, and ought to be an universal, rule to call all that are outside of all the florets involucral bracts, and those only which are within the outer rows of florets receptacular paleæ.

With regard to the use made of the presence or absence of these paleæ not only as a generic but as a subtribual or even tribual character, it proves with certain restrictions to be a good one, although in some cases it is very artificial or uncertain. Thus the rigid, usually persistent, receptacular paleæ are constant, or nearly so, in Helianthoideæ and the subtribe Buphthalmeæ of Inuloideæ, and never occur in Helenioideæ; whilst the thinner more deciduous ones of a very few small genera of Vernoniaceæ, Eupatoriaceæ, Asteroideæ, and Senecionideæ are sometimes inconstant in the same genus. In Anthemideæ this character conveniently, although somewhat artificially, separates the Euanthemeæ from the Chrysanthemeæ. In Cichoriaceæ, where, from the absolute uniformity of the florets, there is such a dearth of distinctive characters, these paleæ have been eagerly seized upon for the separation of some subtribes or other divisions; but a very little examination will show that they are at most of generic value for the separation of such closely allied groups as *Hypochœris* from *Leontodon*, *Rodigia* from *Crepis*, &c. The peculiar shape assumed by the paleæ is often of much more absolute generic importance, as, for instance, those of *Scolymus*, which are accompanied by so many other characters in habit, involucre, receptacle, &c., although still with the uniform florets of Cichoriaceæ.

There is a state of the receptacle which has been variously described as paleaceous or naked, or neither, and which certainly sometimes passes from one to the other. On the naked receptacle each floret, after the fruit has fallen off, leaves a more or less marked scar, either on a small protuberance which may be said to be a rudimentary pedicel, or in a depression in which the achene was seated. In the former case the receptacle is said to be *scrobiculate* or furrowed by the depressions round the protuberances; in the latter it is described as *foveolate* or pitted. When there is neither much protuberance nor depression, but the area of each achene is marked by a more or less distinctly raised line round its circumference, the receptacle is said to be *areolate*. When this line is more raised and jagged on the edge, or broken into short setæ or paleæ, the receptacle is *fimbrillate*, *setiferous* when these setæ are elongated; and if the margins of the pits rise considerably (sometimes enclosing the whole achene) it is termed *alveolate* or honeycombed. All these varieties in the non-paleaceous receptacle are usually noticed in generic characters, and they are sometimes constant in good genera; but in general they have been too much insisted on, and have produced purely artificial combinations. The Cynaroideæ, however, are remarkable for the setose character of the receptacle throughout the tribe, with the exception of *Onopordon* and very few other species rather than genera, where the setæ become very short or disappear altogether, and a few others where the setæ are more or less combined into true paleæ. The alveolate receptacle is most remarkable in some small or monotypic genera belonging to very different tribes, *e. g. Albertinia* in Vernoniaceæ, and *Baldnina* in Helianthoideæ. It is also characteristic of several genera of Arctotideæ.

When the involucral bracts of the innermost row precisely subtend the florets of the outermost row, and more or less enclose or become adnate to them, or assume more or less of the character of receptacular paleæ, they often acquire a generic or even a subtribual importance, as in several Helianthoideæ, Helenioideæ, or Cichoriaceæ, although occasionally the difference may be little more than specific.

9. *Differences in the Foliage.*

The foliage in Compositæ is, within certain limits, as variable as in other large orders. It has no one peculiar character which cannot be matched in many other orders; and the only two features of importance which it does not possess are (1) that there are no stipules (for the auricular expansions at the base of the petiole in some species of *Liabum*, a very few Helianthoideæ, &c. cannot be properly designated as such), and (2) that the leaves, though often much divided, are never compound with articulate leaflets. Amongst all variations to which it is liable, there is one only of any systematic importance—the difference between the opposite (including the rare instances of strictly verticillate) and the alternate leaves, which sometimes constitutes a good, though not quite absolute, tribual character, although also in other instances it is not even generic. Thus the leaves are alternate, with few exceptions, in Vernoniaceæ, Asteroideæ, Inuloideæ, Anthemideæ, Calendulaceæ, Arctotideæ, Cynaroideæ, Mutisiaceæ, and

Cichoriaceæ—the exceptions being 2 species in 465 in Vernoniaceæ, 1 genus and some 10 or 12 stray species out of 1470 in Asteroideæ, about 20 species out of 1150 in Inuloideæ, about 6 in 650 in Anthemideæ, 10 in 115 in Calendulaceæ, 2 in 450 in Mutisiaceæ, and no exceptional opposite leaves known in Arctotideæ 250 species, Cynaroideæ 880, or Cichoriaceæ 720 species. Alternate leaves are also prevalent in Senecionideæ, but with nearly 10 per cent. exceptional opposite ones (usually in distinct genera). In Helenioideæ the opposite and alternate are rather more equally divided, the former being the more frequent; and opposite leaves, at least in the lower part of the stem, are the rule in Eupatoriaceæ and Helianthoideæ, although with several striking exceptions. Entire, toothed, or divided leaves may be respectively prevalent in tribes or genera, but rarely in a degree to be much relied on for a general character. The much-divided leaves, for instance, so common in Anthemideæ are exceedingly rare in Vernoniaceæ, Eupatoriaceæ, and Inuloideæ. The prickly-lobed foliage of so many Cynaroideæ is scarcely to be met with elsewhere, except in a few Arctotideæ (Gorterieæ), one small genus of Cichoriaceæ (*Scolymus*), and here and there in monotypic genera scattered through other tribes.

10. *Differences in Habit, Stature, and General Inflorescence.*

In habit and stature, Compositæ are as variable as other large orders, without these differences being often even of generic importance, although they may sometimes give useful indications. Arborescent Compositæ are rare; and frutescent ones prevail only in comparatively few genera; but in some cases these habits may assist in the discrimination of groups where more absolute characters fail, especially when the differences are connected with geographical distribution. Thus in the great mass of Heterochromous Asteroideæ and Conyreæ, including the large genera *Aster*, *Erigeron*, and *Conyza*, taken in their widest sense with a multitude of smaller genera around them, there is no one positive character to separate the groups, large or small, into which the six or seven hundred species have been distributed,—nothing absolute to separate *Aster* from *Conyza*, which nevertheless no experienced synantherologist would dream of uniting. Here, therefore, stature, combined with geographical distribution, have been appropriately called in aid by Weddell, excluding all the southern, usually frutescent, species from the northern, constantly herbaceous, *Asters*; and there are many instances in other tribes where a shrubby or herbaceous habit may similarly assist in distinguishing natural genera. Beyond this, habit is systematically as vague a character in Compositæ as in other orders, acquiring importance only in geographical botany for the distinction of those plant-forms of which Grisebach has made so much use in his studies of geographical distribution with reference to climatology.

The general inflorescence in Compositæ (that is, the successive development of the flower-heads) is invariably centrifugal, whilst the ultimate inflorescence (the successive development of the florets within the head) is as constantly centripetal; and this circumstance is very important in characterizing the compound inflorescence of the subtribes Lychnophoreæ in Vernoniaceæ, Lagasceæ in Helianthoideæ, Angiantheæ in Inuloideæ, and of several genera of Filagineæ, Relhanieæ, Buphthalmeæ, Cynaroideæ, &c. In these cases numerous capitula, closely sessile on a common receptacle, are collected into a globular, oblong, or depressed cluster often surrounded by a common involucre, the whole assuming the appearance of a single flower-head. This is more especially the case when each individual head is reduced to a single floret with two, three, or very few involucral bracts. Such compound clusters have been sometimes confounded with single flower-heads like those of *Albertinia,* where the very deep and fringed alveoli of the receptacle resemble the separate involucres of the compound cluster. In such cases the difference between the centripetal inflorescence of *Albertinia* and the centrifugal one of *Eremanthus* has been well pointed out by Schultz Bipontinus. I am not aware of any other very marked generic character to be derived from the inflorescence of Compositæ. If in a few instances the heads are apparently axillary and sessile, it is from the abbreviation of the flowering branch. In *Liatris* the inflorescence is spicate or racemose, but always with the terminal head first developed. In this case the genera *Trilisa* and *Carphephorus* are chiefly distinguished by the corymbose inflorescence, accompanied, however, by some other characters.

Among miscellaneous vegetative characters must be included indumentum, to which we have not perhaps paid sufficient attention. Mr. Archer, in a paper published in the fifth volume of our Journal, has shown its value in the classification of the numerous species of *Olearia.* The stellate hairs have also been shown to be a good generic character for the separation of *Hieracium* and

Andryala from *Crepis*, of *Bedfordia* from *Senecio*, &c.; a certain glandular odoriferous indumentum is characteristic of most Madieæ, Buphthalmeæ, and a few others; and many other instances of the generic value of differences in the nature of hairs might be adduced, although the subject has not as yet been sufficiently worked out. The presence or absence, abundance or paucity, greater or less development of any description of indumentum appears never to be of more than specific value.

11. *Differences in Geographical Distribution.*

I purpose entering into the geographical distribution of Compositæ under a separate head. I only mention it now to show the importance of taking it into consideration in the demarcation of generic groups. If the two theories be admitted, that allied species and genera have a common origin, and that the descendants of a common stock placed in different regions having no intercommunication will vary in these different regions with different combinations of characters, it will be seen how much geographical distribution may be made to check the value given to generic or other groups founded upon technical distinctions. But the use of geographical distribution as a generic character is liable to many errors. There are especially two great difficulties to overcome:—first to determine upon how far geographical distribution is due to origin, and how far to climatological influences; and, secondly, to decide upon the all-important distinctions between what we may, with Hewett Watson, designate as true *denizens* of a country, *colonists*, and *aliens*: and even among the denizens a still more difficult, although important, point for consideration is the remoteness of the period at which the common stock has been connected with the flora of other countries. For instance, the Helichryseæ, as well as the Arctotideæ (*Cymbonotus*), of Australia are closely allied to the corresponding South-African groups without having a single species in common, excepting such as are known to be modern colonists. In the case of Helichryseæ the forms have multiplied exceedingly in both regions in the same or in different directions, and have every right to be designated as true native races. But Arctotideæ, numerous in South Africa, have assumed only one form in Australia. Is that form to be regarded as of contemporaneous origin with others common to the two regions, but modified into a local generic type, or is it some old colonist still to be found, or perhaps now extinct, in South Africa? is a question which remains undecided.

III. Sketch of the Primary Divisions of the Order.

In determining upon the sequence of tribes and subtribes to be adopted in our 'Genera Plantarum,' we have here, as elsewhere, endeavoured to avoid all useless changes in the Candollean method so generally followed; and we have abandoned some transpositions which I had proposed in the 'Flora Hongkongensis' and 'Flora Australiensis.' I had there, for instance, commenced with the Cynaroideæ in order to place them in juxtaposition with Vernoniaceæ; but on working out all the allied genera which I had not previously examined, I have found that they were as well, if not better, placed in the position De Candolle had assigned them. As, however, there are a few other important alterations above alluded to which appeared to me absolutely essential in order to give more definiteness, as well as a more natural character, to some of the great divisions of the order, it may be useful to review shortly the modified characters I would now assign to the thirteen tribes we have adopted, referring for the technical synopsis to our 'Genera Plantarum.'

1. *Vernoniaceæ.*

We have reduced the Vernoniaceæ to those which have uniformly homogamous capitula with hermaphrodite florets never yellow. This removes several genera which in minor characters also were very exceptional in the tribe. The Pectideæ, which have not even the style of Vernoniaceæ, resume their place with the Tagetineæ under Inuloideæ; the Liabeæ are transferred to Senecionideæ, notwithstanding their style, which, however, is not absolutely without example in other genera of that tribe; and *Gundelia* and *Platycarpha* form a small subtribe of Arctotideæ next to Cynaroideæ.

Vernoniaceæ thus modified are usually perennial herbs or shrubs, rarely trees, or very rarely annuals. Their leaves are, with the exception of two or perhaps three species, alternate, entire, toothed, or very rarely lyrately pinnatifid; the involucral bracts imbricate in several rows, except in a very few small anomalous genera, where they are reduced to two equal rows or to a small definite number. The capitula are uniformly homogamous, with the florets all hermaphrodite, and equally fertile or rarely slightly diœcious; they are sometimes reduced to a single floret; and in several genera they are closely clustered, forming a dense globular or oblong compound head with or without a common involucre. The receptacle is naked or slightly fimbrillate, except in two monotypic genera where it bears paleæ subtending the florets, and one where it is deeply alveolate. The corollas are tubular, regular, with five narrow lobes to the limb, and varying from a reddish purple to nearly white, except in one monotypic genus where they are blue and expand into a five-lobed ligula, approaching that of Cichoriaceæ, in one small genus in which they are more deeply split on the inner side, nearly as in some Mutisiaceæ, in one species of *Veronia* where they are somewhat bilabiate, and in two monotypic genera where they are very small with the lobes reduced to short teeth; their colour is never yellow. The anthers are never without the terminal appendage to the connective; they are more or less emarginate or sagittate at the base; the auricles of contiguous anthers are usually connate to the end, obtuse or acute, or very rarely produced into short combined or distinct points or rudimentary tails. The style-branches are slender, acute, or scarcely obtuse, uniformly and shortly hirsute, the stigmatic series towards the base on their inner surface not very conspicuous; and in two monotypic (otherwise anomalous) genera the style is exceptionally almost entire. The achenes are usually terete or slightly flattened and equally ten-ribbed; but in some genera or species they are five- or four-angled, occasionally also with more than ten ribs, and in one monotypic genus perfectly smooth and shining. The pappus is usually setose and copious; the setæ in some genera flattened into paleæ, and in a very few others very much reduced or absolutely wanting.

2. *Eupatoriaceæ.*

We have reduced De Candolle's Eupatoriaceæ, as we have done his Vernoniaceæ, by withdrawing the genera with heterogamous capitula, which we have referred to Senecionideæ, leaving the tribe one of the best-defined by its style, as well as by several secondary characters.

Eupatoriaceæ are herbs or shrubs, rarely trees, very rarely annuals. The leaves, as a rule, at least the lower ones, are opposite and entire or toothed; but in a few genera they are all alternate, and exceptionally so in several others; and in very few species they are divided. The involucral bracts are imbricate in several rows or nearly equal in about two rows, in some genera reduced to four, five, or six. The capitula are always homogamous, with all the flowers hermaphrodite and fertile, and are very rarely reduced to a single floret. The receptacle is without paleæ, except in three or four genera where deciduous paleæ subtend the florets in some or all of the species. The corollas are tubular and regular, the limb variously shaped, with five or rarely four short teeth, very rarely (in *Liatris* and its allies) with the longer lobes of Vernoniaceæ; they vary in colour from pink or purplish to white or pale yellowish, never truly yellow. The anthers in one subtribe are truncate at the top without the normal appendages which are present in the other subtribes, as in the generality of Compositæ; they are uniformly obtuse at the base, without prominent pointed auricles or tails. The style-branches are elongated, terete or somewhat flattened, obtuse or club-shaped towards the end, minutely papillose, but not hairy, with the stigmatic series rather obscure on the inner surface towards their base. The achenes in the first two subtribes are four- or five-angled, or rarely flat; in the third subtribe more terete and ten-ribbed: the pappus usually of fine but rigid setæ in one or two rows, in a few small genera plumose or nearly so, in some others reduced to a small definite number, or intermixed with short scales or paleæ, or the whole pappus reduced to these small paleæ or entirely deficient.

3. *Asteroideæ.*

We limit the Asteroideæ to the genera with tailless anthers and with appendages to the style-branches. The subtribes or divisions Sphærantheæ, Tarchonantheæ, Plucheineæ, Inuleæ, and Buphthalmeæ of De Candolle form part of our great tribe of Inuloideæ; and the Eclipteæ pass into the Helianthoideæ, most of the genera enumerated by De Candolle under the former name having nearly related or identical genera among the latter. The Asteroideæ thus limited are for the most part readily distinguished, by the above characters of the style and anthers, from all other tribes; but there are a few Inuloideæ and Senecionideæ where the involucre and other secondary characters must be called in aid.

Asteroideæ are mostly herbaceous perennials, or sometimes annuals; but a few southern or insular genera are shrubby, rarely growing into small trees. The leaves are, with very few exceptions, alternate, entire or toothed or occasionally divided, but much less frequently so than in Anthemideæ. The involucral bracts are usually imbricate in several rows, in a few genera all nearly equal in about two rows. The capitula are usually heterogamous, with one or more outer rows of female florets rarely sterile; the disk-florets also most frequently fertile, although in a few genera constantly sterile, and in a few others the capitula are homogamous from the deficiency of the female florets. The receptacle is usually naked, pitted, or shortly fimbrillate, rarely bearing deciduous paleæ subtending the florets. The corollas of the female florets are sometimes produced into a trimerous entire or toothed ligula, the two inner lobes of the limb entirely deficient; or the corollas are slender, shorter than the style and truncate at the end, or with a small two- or three-toothed limb; those of the disk are regular, the limb more or less dilated or campanulate, with five, rarely four, teeth or short lobes; they are usually yellow, whilst those of the ray are in some genera homochromous, in others heterochromous, and white or variously coloured. The anthers are never without the normal terminal appendages to the connective, and either obtuse at the base or rarely sagittate with acute auricles, in a very few species mucronate, or almost produced into minute fine tails. The style-branches of the fertile disk-florets are more or less flattened, the marginal stigmatic series usually conspicuous, and beyond them a terminal papillose or hirsute appendage, sometimes very short and obtuse, more frequently triangular or lanceolate, occasionally narrow and elongated, almost as in Vernoniaceæ. Where the disk-florets are sterile, the style-branches are very narrow, or the style remains undivided. The achenes are usually small, flat, with nerve-like margins, or more or less five- or more ribbed, and becoming terete; rarely produced into a beak, still more rarely, if ever, winged. The pappus is usually setose and copious in one or more rows; in a few genera the setæ are plumose, in others much reduced or very few, or absolutely none, rarely replaced or accompanied by small thin paleæ.

4. *Inuloideæ.*

The tribe of Inuloideæ, as we propose to restore them, are nearly the same as the Inulées of Cassini. They consist of De Candolle's subtribes Sphærantheæ, Tarchonantheæ, Plucheineæ, Inuleæ, Cæsulineæ, and Buphthalmeæ taken from his tribe of Asteroideæ, and of the Angiantheæ, Cassinieæ, Helichryseæ, Seriphieæ, Antennarieæ, Leysserieæ, and Relhanieæ subtracted from the Senecionideæ. Their chief distinction from the two tribes they are thus withdrawn from consists in the basal appendages of the anthers, and in the absence of those terminal appendages to the style-branches of the fertile disk-florets which are almost universal in Asteroideæ, and occasionally, if not very frequently, observable in Senecionideæ.

The leaves of Inuloideæ are, with very few exceptions, alternate and entire, occasionally decurrent, very rarely opposite or lobed, the involucral bracts usually imbricate in several rows, scarcely ever showing that equality of a single or inner row, with or without small outer ones, so frequent in Senecionideæ and Helenioideæ. The capitula are most frequently heterogamous, with one or more rows of female florets almost, if not quite, universally fertile, the disk-florets sometimes also fertile, but in not a few genera sterile; in some genera, however, the capitula are diœcious; and in a considerable number of the *Helichrysum* group of the subtribe Gnaphalieæ, in all Angiantheæ, and in a few genera of other subtribes they are homogamous from the total absence of female florets. The receptacle is generally without paleæ, except in the subtribes Buphthalmeæ and Filagineæ, and a very few scattered genera of other subtribes, where it is wholly or partially paleaceous. The corollas of the female florets are either short, slender, and minutely toothed at the summit without any expanded limb, or produced into a trimerous entire or toothed ligula, the two inner lobes of the limb either entirely deficient or very rarely appearing in the shape of one or two short slender appendages at the base of the ligula. The corollas of the disk are generally those of Asteroideæ, Senecionideæ, and allied tribes, with four or five short teeth or lobes, very rarely more deeply lobed, those of both sexes almost, though not quite, universally homochromous and usually some shade of yellow. The anthers are never without the terminal appendage to the connective, which is normal in its shape; they are always more or less sagittate at the base; the auricles of adjoining anthers usually connate to the end and produced beyond the polliniferous part into tails or fine hair-like appendages, either simple or fringed with long hair-like branches. These appendages or tails may be all free, or those of adjoining anthers connate, so as to form ten or five only to the whole andrœcium. In the former case they are sometimes (*e. g.* in many Gnaphalieæ) so fine and short, and lie so close to the filament, that they may be readily, and have been frequently, overlooked; and they are, as above mentioned, absolutely wanting in some twelve to twenty species out of 1100. The style-branches of the fertile disk-florets may be more or less flattened, slender, or somewhat dilated towards the end, rounded at the tip, or truncate and penicillate, as in *Senecio*, but always without terminal appendages, the stigmatic lines reaching quite, or very nearly, to the end. Where the disk-florets are sterile, their styles are almost always undivided and strongly papillose or hirsute. The achenes are various, usually very small, flat, terete, or angular in the subtribes with filiform female florets, longer in the radiate subtribes, very rarely rather large and black, as in so many Helianthoideæ, rarely produced into a beak, and never either winged or thick and hard or fleshy. The pappus is usually setose with simple or plumose setæ, but in the subtribe Buphthalmeæ more frequently paleaceous, and in a few genera or species of various subtribes reduced to a corona or very scanty or wholly deficient.

5. *Helianthoideæ.*

Our Helianthoideæ consist chiefly of De Candolle's subtribes Melampodineæ and Heliantheæ, and of his subdivisions Eugalinsogeæ and Madieæ, to which we have added the Eclipteæ, placed by De Candolle under Asteroideæ on account of a supposed conformity of the style to that of the latter and not of the former tribe. But a closer examination has entirely put an end to this artificial distinction, and the Eclipteæ do not even remain a distinct group of Helianthoideæ. De Candolle's nine genera have to be distributed into different subdivisions. Thus ***Blainvillea*** cannot be removed from its closely allied ***Wedelia***; ***Salmea*** is very near ***Verbesina***; ***Dahlia*** comes next to ***Coreopsis***, ***Siegesbeckia*** to ***Jægeria***, ***Sabazia*** to ***Gymnolomia***; and ***Cryphiospermum*** is identical with ***Enhydra***. The Helianthoideæ thus modified differ from Asteroideæ in their usually combining opposite leaves, a rigidly paleaceous receptacle, and a rigid pappus of few awns or paleæ. All these characters, however, have exceptions, and many minor circumstances must be taken into account in fixing the limits of the tribe.

Helianthoideæ are usually rather coarse herbs or shrubs, their indumentum generally more or less scabrous or hirsute, or sometimes silky with simple hairs, rarely intricately tomentose or woolly. The leaves, at least the lower ones, are most frequently opposite and entire or toothed; in some genera the upper ones, and in a few the whole of them are alternate; and much divided leaves occur in some of the subtribes. The involucral bracts are very often biseriate, with a difference between the outer and inner rows, but sometimes imbricate in several rows, very generally more or less herbaceous, but sometimes dry and rigid or membranous, very rarely the inner ones scarious. The capitula are most frequently heterogamous, with a single row of female and fertile or neutral and sterile florets in the circumference, the disk-florets fertile or in some subtribes uniformly sterile. In some genera also the capitula are (by the imperfection rather than by the absence of the male or female organs) strictly unisexual, either monœcious or diœcious; and sometimes the capitula are homogamous from the deficiency of the ray-florets. The fertile florets are uniformly subtended, and sometimes embraced by or enclosed in the paleæ of the receptacle or innermost bracts of the involucre. These paleæ are deficient only in the centre of the capitulum in the subtribe Millerieæ, where the disk-florets are always sterile, and in some Madieæ, where they are frequently so. The corollas of the outer female or neutral florets are usually ligulate and trimerous, very rarely with an irregularly campanulate limb, or shortly tubular; in the subtribe Ambrosieæ they are reduced to a short conical tube or entirely deficient; the corollas of the disk with five, or rarely four, short lobes or teeth; in a very few small genera there is a slight tendency to the bilabiate form, either by the development of one or two small fine upper lobes to the ray-florets, or by an irregularity in the disk-florets. These disk-florets are generally yellow, sometimes white, rarely purple; the rays usually homochromous. The anthers have the normal terminal appendage, except in *Eleutheranthera* and possibly a few species of allied genera; and in the Ambrosieæ these appendages terminate in inflected points; the basal auricles sometimes very short and obtuse, are more frequently acute, and sometimes produced into short points, which have been termed tails. The anther-tube, as a whole, is in many genera much exserted and black. The styles of the fertile disk-florets vary in different genera, from the truncate tips of *Senecio* to the appendiculate branches of Asteroideæ, or the subulate hispid branches of Vernoniaceæ. As in other tribes, the style remains undivided in the disk-florets of most genera where they are constantly sterile. The achenes are often rather large, either thick and hard or sometimes even succulent, or laterally or dorsally flattened and sometimes winged. The pappus most frequently consists of two or three rigid awns or scales corresponding, and often continuous, with the principal ribs or angles of the achene, with or without smaller intermediate scales; in most Galinsogeæ the scales are more numerous and often equal, as in Helenioideæ, and in a considerable number of genera the pappus is entirely wanting; any tendency towards the setose pappus of Senecionideæ is exceedingly rare, the nearest approach to it being in some species of *Calea*.

6. *Helenioideæ*.

Our Helenioideæ, as we propose to circumscribe them, may perhaps not be so readily admitted as a distinct tribe as most of the others; for the genera we have grouped under that name pass respectively into Helianthoideæ, from which they differ chiefly in the absence of paleæ to the receptacle, or into Anthemideæ, from which they are separated by the involucre, habit, and in great measure by geographical distribution; and some species or small genera have almost the pappus, as well as other characters, of Senecionideæ. Yet we believe the tribe to be not unnatural, and that in thus uniting the groups of genera it consists of we leave the tribes from which they are withdrawn much better defined. These groups are De Candolle's division Gaillardieæ of his subtribe Helenieæ, his subtribe Tagetineæ, the few-flowered epaleaceous genera of his Flaverieæ, all included by him in his large tribe of Senecionideæ, with his Pectideæ, taken from Vernoniaceæ, of which, as above observed, they have neither the style nor the habit, involucre, or pappus.

Helenioideæ are all herbaceous or very shortly shrubby at the base, with the exception of the somewhat anomalous small genus *Cacosmia*. They are not so coarse nor so roughly hirsute as the majority of Helianthoideæ, often glabrous; the indumentum, when present, is usually cottony or soft, sometimes glandular or viscid. The leaves are often opposite, but in some genera even the lower ones are alternate, and vary from entire or toothed to the divided form so prevalent in Anthemideæ. The involucral bracts are generally either in about two rows and more or less herbaceous, as in Helianthoideæ, but usually thinner, or in a single row with or without a calyculus, as in most Senecionideæ; but in a very few genera they are imbricate in several rows, or approach those of Anthemideæ, with the inner ones scarious. The capitula are heterogamous in most genera, with a single row of female or rarely neutral florets in the circumference; the disk-florets fertile or rarely sterile, homogamous in some genera by the absence of the female florets. The receptacle is uniformly naked or slightly pitted, except in *Gail-*

lardia, where it is fimbrillate. The corollas of the female or neutral florets are ligulate and trimerous, usually forming a prominent ray, but sometimes small; those of the disk-florets with five, or rarely four, short lobes or teeth; all usually yellow and homochromous, or those of the disk purple, and the same colour extending sometimes to the base of the ray. The anthers are like those of Helianthoideæ with the normal terminal appendage, the basal auricles obtuse or acute, but scarcely pointed; the style-branches vary in different genera as much as in Helianthoideæ, from the truncate tips of *Senecio* and of the Anthemideæ to the appendiculate branches of Asteroideæ or the subulate hispid branches of Vernoniaceæ. The undivided style has been only observed in the sterile disk-florets of *Blennosperma*. The achenes are frequently longer and narrower than in the adjoining tribes, angular or terete, rarely flattened or winged, but in the Euhelenieæ usually turbinate and hairy or woolly. The pappus is normally paleaceous; the scales definite or indefinite, obtuse or acute, or, when numerous, occasionally attenuated into setæ, almost like those of Senecionideæ; in some genera very short, rarely united in a cup, and in many genera liable to disappear altogether in one or more species.

7. *Anthemideæ.*

Our tribe of Anthemideæ is the same as De Candolle's subtribe of that name, after deducting two or three small genera which had been inadvertently placed there. It is closely connected as to a few genera with the subtribe Euhelenieæ of Helenioideæ, as to one or two others with Senecionideæ; and the group of Cotuleæ almost pass into some of the epappose Asteroideæ; but, generally speaking, the involucres, the habit, the styles, and the want of any setose or aristiform pappus readily distinguish the tribe.

Anthemideæ are often odoriferous in their herbage; the great majority are herbaceous; but they also include shrubby species or genera; their indumentum is rather woolly, glutinous, or soft than coarsely hispid. Their leaves are, with very few exceptions, alternate, and most frequently lobed, much divided, or at least toothed; in a very few small genera opposite and entire. The involucral bracts are usually imbricate in several rows, dry or, the inner ones at least, scarious at the end; in several genera, however, of the *Cotula* group they are nearly equal in about two rows and thinly herbaceous. The capitula are most frequently heterogamous, with one or, in some Cotuleæ, several rows of female fertile, or rarely neutral and sterile, florets in the circumference; the disk-florets fertile, or in a few small genera sterile; but there are also several genera in which the capitula are quite homogamous, the ray-florets being deficient. The receptacle is with or without paleæ; when present, they are usually deciduous. The corollas of the outer florets are either short, slender, and minutely toothed at the summit, without any expanded limb, or more frequently produced into a trimerous, entire, or toothed ligula; the two inner lobes entirely deficient, or the whole corolla of the female florets reduced in some Cotuleæ to a small rudiment or entirely wanting: those of the disk are generally those of Asteroideæ and Senecionideæ, with four or five, rarely three, short teeth or lobes; these disk-florets almost always yellow, the rays either homochromous or heterochromous (white or pink) in one and the same genus. The anthers have the normal terminal appendage, and are usually obtuse at the base, always without tails or distinct points. The style-branches of the disk-florets are more constant in their shape than in most tribes, truncate and usually penicillate at the end, except in the sterile florets of two or three somewhat anomalous monotypic genera, where they are slender; and whether truncate or not, they remain connate to the end in the sterile florets of a few genera. The achenes are usually rather small, often angular and truncate at the top, or those especially of the ray dorsally flattened or triquetrous and sometimes winged. The pappus is very commonly deficient; when present, reduced to a paleaceous ring or cup or oblique auricle, very rarely consisting of small distinct paleæ, passing, in one genus, almost into the setæ of Senecionideæ.

8. *Senecionideæ.*

Our tribe of Senecionideæ consists of the subtribe Senecioneæ of De Candolle, with the addition, first, of the Liabeæ and Tussilagineæ, taken from his Vernoniaceæ and Eupatoriaceæ respectively, on account of their heterogamous capitula with the florets most frequently yellow; and, secondly, of the Othonneæ, removed from Cynareæ as not having the habit or characters of that tribe, the undivided style of the disk-florets being that of similarly sterile florets of most tribes. The anthers distinguish them from Inuloideæ, the pappus and habit from Helianthoideæ and Helenioideæ, the pappus and involucre from Anthemideæ.

The leaves of Senecionideæ are very various—alternate in the great majority, but strictly opposite in a few genera, entire or variously toothed or divided. The indumentum is usually cottony and whitish or soft, sometimes glutinous, rarely coarsely hirsute, in one genus stellate. The involucre very generally consists of a single or almost simple inner row of equal, more or less herbaceous or membranous, rarely almost fleshy, bracts, united or free, with or without more or less of smaller outer ones, commonly called a calyculus; in a few genera, however, they gradually increase from the outer to the inner ones; they are never pungent, and rarely appendiculate. The capitula are usually heterogamous; the female florets in a single row almost always fertile; the disk-florets fertile in most genera, but all, or mostly, sterile in some others; and in a few genera, and several species of others, the female florets are deficient, leaving the capitula homogamous. The receptacle is usually without paleæ; these, however, are present, subtending the florets and usually deciduous, in two small genera (one of them monotypic). The corollas of the female florets are usually ligulate, with a trimerous spreading lamina, entire or toothed, the two inner lobes entirely wanting, or rarely present in the shape of one or two fine teeth or short filiform lobes; the disk-florets regular, with five, or rarely four, short lobes or teeth, the latter yellow or rarely white or purple; the ray-florets homochromous or, in a few species only, heterochromous. The anthers have the normal terminal appendage, and are usually sagittate at the base, with the auricles usually acute and sometimes produced into small points, but never into the hair-like tails of most Inuloideæ. The ordinary form of the style-branches of the disk-florets is with dilated truncate penicillate tips, as in Anthemideæ; but these in some genera bear obtuse or acute terminal appendages, hairy, as in Asteroideæ, but perhaps rather less flattened, and therefore called cones, and their hairs usually shorter than those which surround the base of these appendages; but in a few cases the styles pass into those of Asteroideæ, and in others the branches are so narrow and so much more equally hairy or papillose that they become in some genera almost, in others quite, like those of Vernoniaceæ or Eupatoriaceæ. Where the disk-florets are sterile, the style-branches are usually filiform and connate to the end. The achenes are various, usually angular or terete and striate, truncate or shortly contracted at the end, not beaked, flattened only in two or three small genera, and never winged. The pappus almost always setose and copious; the setæ usually fine and soft, simple or rarely plumose, in a few small genera rigid, in a very few small genera or species of larger ones deficient on the achenes of the ray, and in *Gamolepis* on all the achenes.

9. *Calendulaceæ.*

Our small tribe of Calendulaceæ consists of De Candolle's subtribes Calenduleæ and Osteospermeæ, which he classes under Cynaroideæ, but which we consider much more closely connected with Senecionideæ. They have the style of the latter tribe, and differ from it chiefly in their involucre, the constant deficiency of pappus, and usually by the forms assumed by the ripe achenes of the outer, or of the next to the outer, row of florets.

Calendulaceæ are herbs or small shrubs, usually much branched or spreading from the base; the leaves are alternate or very rarely opposite, entire or toothed or lobed, very rarely much divided. The involucral bracts are usually narrow, more open than in Senecionideæ, in one, two, or rarely three rows, herbaceous or membranous, often with scarious margins. The capitula are heterogamous, with the female florets in a single row, either fertile or sterile; the central disk-florets almost always, and sometimes the whole of them, sterile; the outer row of disk-florets often the most perfect of the capitulum. The receptacle is naked, or rarely bears a few setæ amongst the florets. The corollas of the female florets are ligulate, with a trimerous spreading or sometimes reduced lamina, entire or toothed; the two inner lobes entirely deficient; the disk-florets regular and usually with five short lobes or teeth, usually yellow. The corollas of the ray homochromous. The anthers have the normal terminal appendage, and are sagittate at the base, with acute, or rarely obtuse, auricles, often produced into small points, which might be regarded as short tails. The styles of the disk-florets, when these are fertile, have their branches usually truncate and penicillate at the tips, as in Senecionideæ; in the sterile florets the style is often undivided, as in many other tribes. The fertile achenes, or at least the outer row, often acquire an unusual development and various irregular shapes, much curved or arched or winged, or sometimes thick and hard, and they have never any pappus.

10. *Arctotideæ.*

Our tribe of Arctotideæ comprises, first, the subtribes Arctoteæ and Gorterieæ of De Candolle's Cynaroideæ, differing from those we leave in the latter tribe in their heterogamous usually radiate capitula, in the absence of anther-tails, and, in some measure, in their styles; and, secondly, of the genera *Gundelia* and *Platycarpha*, withdrawn from Vernoniaceæ, of which they have neither the habit nor the styles nor any other important characters. Thus constituted, the Arctotideæ appear to form a connexion between Anthemideæ and Calendulaceæ on the one hand and Cynaroideæ on the other.

Arctotideæ are sometimes stemless or spreading herbs, more or less cottony-white or glabrous and *Anthemis*-like, sometimes with the prickly aspect of many Cynaroideæ, occasionally assuming the common South-African small shrubby form. The leaves are always alternate or radical, often much lobed and sometimes prickly-toothed. The involucral bracts are imbricate in several series, free with the inner ones often scarious at the end in the subtribe Euarctoteæ, usually connate at the base, and hardening after flowering in the Gorterieæ, pungent or prickly-toothed in many Gorterieæ and in Gundelieæ. The capitula are (with very few exceptions where the ray-florets are wanting) heterogamous and radiate, the florets of the ray in a single row and often sterile, and the disk-florets either all fertile or the inner ones, rarely all, sterile. In Gundelieæ the ray-florets are wanting and the capitula collected in close clusters or compound heads, with more or less of a common leafy involucre. The receptacle is usually without paleæ, but in several genera very deeply honeycombed, the raised cells almost or quite enclosing the achenes, or, in one genus, truly paleaceous. The corollas of the female florets are always ligulate, with a trimerous spreading lamina, entire or toothed, the two inner lobes usually deficient, but occasionally appearing as two short or slender teeth; the disk-florets regular, with five or rarely four short lobes or teeth (as in Anthemideæ); in most Euarctoteæ the limb deeply divided into narrow, often erect, lobes (as in Cynaroideæ); in most Gorterieæ and Gundelieæ the disk-florets yellow, the rays homochromous or reddish or purple, especially outside. The anthers have the normal terminal appendage; they are more or less sagittate at the base; the auricles sometimes obtuse, more frequently acute or produced into short points, without the distinct tails of most Cynaroideæ. The style-branches of the perfect disk-florets are linear or oblong, long or short, usually obtuse and papillose outside, the papillæ extending frequently below the ramification, but not ending in an abrupt ring of hairs or swelling as in most Cynaroideæ. In the sterile disk-florets the style is usually undivided. The achenes are usually rather thick, often angular, and sometimes winged, and never beaked, occasionally densely hairy or woolly, without any or with a coroniform or paleaceous pappus.

11. *Cynaroideæ.*

We reduce the Cynaroideæ to the last nine of De Candolle's subtribes, which never have the capitula normally radiate, and in which the styles have usually an abrupt thickening or change of texture or ring of hairs below the ramification, at a point where the external papillæ commence; the branches are also usually very short or reduced to mere teeth. These characters, however, are not quite constant; and it is not easy to express in words any definite limitation of the tribe. Some Mutisiaceæ (Gochnatieæ), indeed, approach it very nearly; but otherwise I believe, there is never any ground for hesitation as to including or excluding any genus in or from it.

The Cynaroideæ are, with very few exceptions, herbaceous, and often assume that peculiar prickly habit which gives them the common name of Thistles. Their indumentum is usually loosely cottony or woolly, rarely silky or hispid. The leaves are always alternate, often sinuate or lobed or divided and prickly-toothed, but sometimes entire and rigidly ciliate or quite unarmed and soft. The involucral bracts are always imbricate, in several, often numerous, rows. The capitula are usually homogamous, but have occasionally an external row (sometimes only a very few) of sterile or female florets. The receptacle, often thick and hard or fleshy, is usually densely covered with rigid, almost paleaceous, setæ, longer or shorter than the achenes, sometimes more or less united into paleæ at the base, in a very few small genera reduced to mere fimbrillæ or minute teeth bordering the slight pits or areoles of the receptacle. The corollas of the circumferential, neutral or rarely female, florets have the limb usually enlarged and regular or slightly irregular, sometimes small and distinctly bilabiate; or if expanded into a ligula, it is pentamerous, as in Cichoriaceæ, only more deeply lobed, like that of *Stokesia* in Vernoniaceæ, never showing the trimerous ligula of the normally radiate tribes. The corollas of the hermaphrodite florets have the deeply and narrowly lobed limb of Vernoniaceæ, but often oblique, still longer and narrower, and more abruptly dilated from the tube. The anthers, with the normal terminal appendages, are sagittate at the base; and, with very few exceptions, the auricles are produced into fringed appendages or tails. The style is usually, as above mentioned, an abrupt thickening or change of texture or ring of hairs (called by Cassini an articulation) at a greater or less distance below the ramification, and is more or less papillose (not hairy) from that to the end: the branches are most frequently short, rather obtuse, and erect or at length spreading, sometimes reduced to a scarcely perceptible notch, sometimes longer and linear; and in a few cases the external ring disappears and the branches are elongated and slightly dilated upwards so as to bring the style nearer to that of the Arctotideæ and of some Inuloideæ. The achenes are usually thick and often hard, rarely flat or winged, and never beaked. The pappus most frequently consists of several, often numerous, rows of rigid setæ, increasing in length from the outer to the inner, or to the next to the inner, row, with sometimes an innermost row more definite in numbers and more paleaceous; or the whole pappus may consist of this single row of definite or indefinite paleæ or setæ, with very few or none at all of the outer setæ; or the pappus may be reduced to short deciduous setæ or paleæ or be entirely deficient.

12. *Mutisiaceæ.*

Our Mutisiaceæ correspond to the Labiatifloræ, considered a suborder by several synantherologists, and comprise the Mutisiaceæ and Nassauviaceæ of De Candolle, excepting, however, from the former the small group of Facelidæ, which had been inserted by Lessing and retained by De Candolle for reasons not very intelligible, and since correctly referred by Weddell to Gnaphalieæ. They differ generally from Cynaroideæ in the corolla of some or all the florets being more or less bilabiate, and the want of the rigid setæ of the receptacle characteristic of most Cynaroideæ; but both characters have exceptions, and the precise limits of the tribe are difficult to fix in general terms.

The habit of Mutisiaceæ is most variable, but very frequently shrubby, or almost stemless except the radical scapes; the leaves alternate or radical, except in two monotypic genera, entire or toothed or pinnatifid, very rarely much divided or prickly. The involucral bracts usually imbricate in several rows, rarely forming a single row of equal bracts, with or without small outer ones, as in Senecionideæ. The capitula are homogamous, heterogamous, or sometimes diœcious; when heterogamous, often more or less radiate, but not always in the contrasted manner of the preceding tribes, the corollas being gradually modified or enlarged from the centre to the circumference, as in some Cichoriaceæ, or the ray-florets are irregular or 4–5-merous. The receptacle is naked or shortly alveolate or fimbrilliferous, not rigidly setose as in Cynaroideæ, but in a few small genera bearing simple paleæ subtending the florets. The corollas exhibit every variation of the 5-merous limb, regular, bilabiate in various proportions, or expanded into a ligula, in a very few exceptional species becoming trimerous by the suppression of the inner lobes. The colour is very various; but the capitula appear to be always homochromous. The anthers have the normal terminal appendage; and the basal auricles have conspicuous, usually fringed, appendages or tails, except in two genera, where there is no trace of them. The style-branches when long are nearly those of Inuloideæ; but they are more frequently short or erect and connivent, or very shortly spreading at the tips, usually obtuse or truncate, always without terminal appendages, and papillose outside or penicillate at the tip in a few genera. The achenes vary much in form; their pappus is usually setose, simple or plumose, or formed of narrow paleæ, very rarely deficient.

13. *Cichoriaceæ.*

The Cichoriaceæ remain within the same definite limits originally assigned to them by Jussieu; they are at once known by their homogamous capitula, with the corallas all expanded into a 5-merous, truncate, 5-toothed ligula; and the only approach to them is traceable in the Vernoniaceous genus *Stokesia*, or in the Mutisiaceous genus *Catamixis*.

Cichoriaceæ are usually herbs, very rarely growing into shrubs or small trees, and are as rarely thistle-like and prickly. The leaves are always alternate or radical, entire or toothed or pinnatifid, rarely much divided. The involucral bracts are imbricate in several rows, or equal in a single row, with or without external smaller ones, and are usually membranous or herbaceous, rarely scarious or rigid and prickly. The capitula are always homogamous, the outer row of florets sometimes rather longer, forming a sort of ray. The receptacle is naked, or in a few genera bears paleæ or setæ subtending the florets. The corollas are uniformly ligulate, with a pentamerous spreading lamina, truncate and 5-toothed at the end. The anthers have the normal terminal appendage, and are sagittate at the base, with acute auricles often produced into a short point. The style-branches are those of the female florets of other tribes, slender, acute or almost obtuse, papillose but not hirsute, sometimes rather broader and slightly flattened. The achenes are various, usually narrow or flat, and sometimes produced into a slender beak. The pappus usually with one or more rows of simple or plumose setæ; but sometimes it consists of thin paleæ or of few setæ or awns, or is entirely wanting.

IV. HISTORY AND GEOGRAPHICAL DISTRIBUTION.

The ancient history of Compositæ must be more purely conjectural than that of many other large groups of plants. The geological record is remarkably scanty; but in the case of the members of this order, the absence of their remains is no proof of their non-existence at various geological periods. They are very rarely aquatic; and a comparatively small number only are to be met with on the borders of such waters as are wont to accumulate stores of organic remains; nor yet do they shed a profusion of leaves likely to be carried to any such hoarding-places. The great mass of them live, die, and are thoroughly consumed, without leaving a single fragment to serve as evidence or indication to future generations. It is only here and there that the winds appear to have carried an achene, by means of its pappus, to some place of deposit; and thus it is that Oswald Heer found in the upper miocene tertiary deposits of central Europe various impressions which he refers, on plausible grounds, to Compositæ. He is also probably justified in his conjecture that the great majority of them belong to Cichoriaceæ, two or three to Cynaroideæ, and that one is probably the achene of an aquatic *Bidens*. All this, if well founded, would show that at that tertiary epoch Compositæ existed in Europe of the same general character as those which are now to be met with. It would seem to prove that they had then already attained that highly differentiated character they now possess, and consequently must have been already of very old date, although they had left no previous record of their existence which has as yet been exposed to our observation. I can find no further reliable notice of fossil Compositæ; for I say nothing of Massalonghi's *Silphidium*-leaves; their reference to Compositæ is only a wild guess without a particle of evidence in support of it; large herbaceous Compositæ are not in the habit of casting their leaves unwithered, so as to have become encased in mud unaltered in shape. Still less need I take notice of Martius's *Lychnophorites*, which have since been more plausibly referred to large monocotyledons of the *Vellozia* type. And even Heer's above-mentioned Miocene Composite achenes are doubted by some palæontologists, who contend that they are seeds of Apocyneæ. Some, indeed, of Heer's figures show the pappus not to be strictly terminal, but to proceed from an oblique or somewhat lateral notch, which is unusual though not unknown in Compositæ (*e. g. Tourneuxia*); but many of the figures might be identified with more than one recent achene and pappus.

In the absence of all direct evidence we are left to judge of the antiquity and origin of Compositæ from their comparative structure and from their geographical distribution, as to both of which we have still much to learn, and in both which respects several of the boldest of modern hypothesists have neglected or been ignorant of much that is known.

A general notion is prevalent, especially among French botanists, that Compositæ are at the summit of the scale of progression in the vegetable kingdom—that De Candolle's idea that the greatest perfection was to be sought for where, as in some Thalamifloræ, the essential parts of the flower, the petals, stamens, and carpels are the most distinct from each other, is altogether erroneous—that these Thalamifloræ are, in fact, the nearest to the Monochlamydeæ, which commence from the base of the Dicotyledonous scale—and that the high degree of consolidation in the floral organs of Compositæ is a strong proof of perfection and thence of a comparatively recent origin. It seems very probable that these views may be correct; yet, on the other hand, we must bear in mind that the numerous monotypic or oligotypic highly distinct genera confined respectively to the widely distant centres of preservation of the Mediterranean region, tropical and Southern Africa, Southern and Western Australia, Chili, the Mexican region, &c., point to a very wide dispersion of the original stock of the order at a very early period, when the physical configuration of the surface of the globe must have been very different from what it is now,—that this dispersion appears, indeed, to have been so early as to give time for the absolute fixation of secondary characters, which in most orders are very inconstant—and that, moreover, previously to this dispersion the stock must have existed long enough to give absolute permanence and an otherwise unexampled constancy to those essential characters of primary importance which I shall recur to in detail. The presence of an involucre, the symmetry of the floral organs, the abortion of the calyx-limb, the æstivation of the corolla-lobes, the syngenesy of the anthers, and, above all, the structure of the pistil, fruit, and seed are not known to offer a single exception throughout the ten thousand species of the order.

But although Compositæ must thus have existed, in some shape or other, but yet with all these essential characters, at an early geological period, the differentiation of the larger groups probably took place after the isolation of the actual centres of preservation. Of the thirteen tribes adopted, two only, Asteroideæ and Senecionideæ, may be said to be cosmopolitan or nearly so. Cichoriaceæ, Cynaroideæ, and Anthemideæ belong to the northern hemisphere with chief centres in the Mediterranean and Central Asiatic regions; a few, but those (except some Cichoriaceæ) either forming part of or closely allied to Europæo-Asiatic genera, have spread over North America and even down the Andes to extra-tropical South America. Calendulaceæ and Arctotideæ are African, extending sparingly into Europe. Vernoniaceæ, Eupatoriaceæ, Helianthoideæ, Helenioideæ, and Mutisiaceæ are essentially American, but with a few types which may have arisen in the tropical and subtropical regions of Africa and Asia. The great tribe of Inuloideæ is for the most part Old-World, although the subtribes Plucheineæ and Gnaphalieæ have been long enough in America to have there formed a very few generic types. Before, however, drawing any further general hypothetical conclusions as to the early history of the order, and the course of its present distribution, it will be necessary to recapitulate successively the data hitherto supplied to us by the several tribes, subtribes, and principal genera it is composed of. For this purpose I propose taking the several tribes successively in their systematic order, although in the further details under each tribe I shall endeavour to take genera and subordinate races as much as possible in their natural rather than in their technical limits. I shall then proceed to consider the chief centres or regions occupied by the present races of Compositæ, the limits to be assigned to them, their distinctive characters and mutual connexions. I must now, however, observe, to prevent misunderstandings in the following detailed notes, that these regions are founded solely on the distribution of Compositæ, and would require much modification as to those orders of plants especially which take a part in forest vegetation. I must also explain that the Mexican region, here often referred to, includes California, W. Texas, and a portion of Central America, and that the Mediterranean region, in the Composite sense, must include the Levant and Persia.

A. DISTRIBUTION OF THE TRIBES AND PRINCIPAL GENERA.

1. *Vernoniaceæ.*

This tribe, as limited for systematic purposes, consists principally of one large genus with a number of smaller ones closely connected with it, forming altogether one subtribual or generic group of a higher order; and to this are added a few small genera so distinct as to leave some doubts as to their real affinities. I shall here, therefore, commence with the principal genus.

Vernonia, a genus, as we now propose to limit it, of nearly 400 species, and closely connected with about 25 smaller genera comprising above 120 more species, has its chief centres in tropical America and tropical Africa, forming in both countries more or less divergent groups, but in different directions, the species more numerous in America, the forms more varied in Africa. From tropical America it spreads more sparingly into North America and extratropical South America, and from tropical into Southern Africa, and eastward into tropical and subtropical Asia, forming in each of these outlying districts more or less local groups. More than three fourths of the genus belong to the section *Lepidaploa*, which, rather from its wide geographical range and connexions than from its happening to include the species first taken as the type, may be conjectured to be nearest to the original form. At least four fifths of its species are tropical American; but it includes also the North-American ones, a portion of those from Africa, and five or six Asiatic species. In this section the achenes are equally 10-ribbed, with the inner setæ of the pappus long and fine, rarely slightly dilated, the outer numerous and short, more frequently flattened and almost scale-like than fine. This great multitude of species has to be methodized and distinguished by foliage, general inflorescence, size, and shape of the capitula, and by the obtuse, acute, or aristate, appressed, or squarrose involucral bracts; but even these secondary characters are most frequently differently combined in the New and in the Old World and in the different regions of each. No other section or group of *Vernonia* can be strictly said to be common to the New and the Old World. Aberrant modifications of some one of the more important characters may indeed be observed in both the regions, but differently combined in the two with other characters.

1. In the two Brazilian species of *Hololepis* and the single Mexican *Leiboldia* there is not the usual disproportion in the pappus, the outer setæ being but little distinguishable from the inner in length, numbers, or rigidity. The Brazilian *Hololepis* is, moreover, remarkable for the large involucres, of which the outer foliaceous bracts conceal the inner ones. The Mexican *Leiboldia* has also rather large involucres; but its bracts are all acute and normally accrescent from the outer to the inner. In the Old World we have in the *Vernonia calycina*, Wall., from Prome, a close representative of the Brazilian *Hololepis* as to habit and involucre, and the pappus also abnormal, but in a direction peculiar to the Old World; the outer setæ, though longer than in *Lepidaploa*, are fewer and shorter than the inner ones. In the tropical-African *V. purpurea*, Sch. Bip., the outer bracts are sometimes enlarged and foliaceous as in *V. calycina*; but the pappus is normal, and the plant is in other respects a true *Lepidaploa*.

2. The tropical-American *Critoniopsis*, containing five or six species, with a normal pappus, is distinguished by its ample panicles of small few-flowered capitula, the involucral bracts obtuse, the inner ones frequently very deciduous, as in the allied genus *Piptocarpha*. This section is not identically present in the Old World, but is there represented by the section *Strobocalyx* of about a dozen species, with similar inflorescence and capitula; but the pappus has the tendency, so frequent in Old-World *Vernoniæ*, to the attenuation, reduction, or almost total disappearance of the small outer setæ of the pappus.

The aberrant forms peculiar either to the New or to the Old World, which, however, we have thought not sufficiently distinct to retain as separate genera, are the following:—

1. In tropical America the three small sections *Stenocephalum*, *Trianthæa*, and *Eremosis* have the normal pappus and other essential characters of the original *Vernonia*; but the narrow involucres contain but very few florets. In *Stenocephalum* the

inflorescence approaches that of the *Lychnophoreæ*, a truly American type; but the section is closely connected with the ordinary *Lepidaploæ* through *V. obtusata*, Less., and others. *Trianthæa* is more normal in general inflorescence as well as in the involucre, except that it contains usually only three florets; and *Eremosis* only differs in these florets being reduced to a single one. Triana's *Lherasia*, from the mountains of Columbia, must be included in the section *Trianthæa*, with a habit still nearer to that of *Oliganthes*. In the Old World when the *Vernonia*-capitulum becomes 3-flowered or only single-flowered (*Monosis Wightiana*, DC.) the species assume the habit, inflorescence, and involucres of *Strobocalyx* above referred to.

Vernonia complicata, *V. bahamensis*, and *V. lepidota*, Griseb., from Cuba or the Bahamas, are insular aberrant forms which require further study and comparison with the S.-American genus *Piptolepis*, or the San-Domingo *Piptocoma*, of which last I have seen no specimen.

2. In the Old World the section *Stengelia*, including *Ascaricida*, with the inflorescence, pappus, &c. of *Lepidaploa*, diverges in the involucres, of which the inner bracts end more or less in membranous coloured appendages, a character not carried further in any allied genera. In some species the setæ of the pappus become flattened and more rigid, showing a tendency towards the paleaceous pappus of the American *Stilpnopappus* and its allies—a tendency which, however, does not appear to be carried any further in any Old-World genus allied to *Vernonia*; for *Herderia* is probably more nearly connected with *Ethulia*.

The sections *Gymnanthemum* and *Xipholepis* are chiefly characterized by the reduction of the outer pappus to fine setæ, few in number, of variable length, and sometimes disappearing altogether—a circumstance towards which American forms show no tendency, except in *Lachnorhiza*, a Cuban species, which, on account chiefly of its peculiar habit and the form of its involucre, very different from those of the Old-World *Gymnanthema*, has been admitted as a distinct insular genus.

The sections *Cyanopis*, *Lepidella*, and *Tephrodes* exhibit a divergence which would at first sight appear important enough to raise them into a distinct genus, but that the main character, the 4- or 5-angled, or almost terete and nerveless, not equally 10-ribbed achene, is so variously combined with others in species which in other respects would belong to *Lepidaploa*, and is, moreover, so vague in some species where the secondary ribs are present but much less prominent than the primary ones, that no tolerably fair line of demarcation can be drawn between the groups. The pappus in the three sections is very nearly the normal one of *Vernonia*: that of *Tephrodes* usually white, copious, and rather soft; that of *Cyanopis* more fragile, approaching that of *Centratherum*; that of *Lepidella* with the outer short row more paleaceous, as in many American *Lepidaploæ*. No American species, as far as I am aware, shows the 4- or 5-angled or the nerveless achenes of these Old-World groups.

The Mascarene section *Distephanus* (two species), with a somewhat different habit, a compact inflorescence, and a remarkably fimbrillate receptacle, might perhaps be maintained as a distinct genus; but the extreme vagueness of the character derived from the receptacle (a tendency to which is observable in several African species) will probably justify its reduction to a section, chiefly geographical, of *Vernonia*. Another supposed Mascarene genus, *Bechium* (a single species), appears to me to be a true *Lepidaploa*, with a slight tendency to the coloured tips to the bracts of the involucre of *Stengelia*, and a somewhat peculiar habit, the leaves being almost radical.

The numerous Vernonioid genera, most of them small or monotypic, which have been maintained around *Vernonia*, partly from habit, but chiefly on account of more or less marked divergences in characters regarded as essential, but which are yet connected with the main group by small gradations, may be classed as follows according to the nature of those divergences:—

1st. In the mucronate or subcaudate anther-auricles.—This is exhibited in one American and three Old-World genera.

The American *Piptocarpha*, with nearly twenty species, is closely connected in involucre, and in one species in inflorescence, with the American section *Critoniopsis* and the Old-World *Strobocalyx*; most species, however, have a peculiar inflorescence of a character much more American than Asiatic or African. The pappus is sometimes the normal Vernonian double one; sometimes the outer series is reduced to a few fine setæ, or disappears altogether, as in the Old-World *Strobocalyx*.

In the Old World the few cases of Vernoniaceæ with subcaudate anthers show a different combination of other characters. The three genera *Centauropsis* from Madagascar with two species, *Adenoon* from the E.-Indian peninsula, and *Pleurocarpæa* from N. Australia, both monotypic, have each a much reduced pappus; in *Centauropsis* it is copious, but shorter than the achene, in *Pleurocarpæa* reduced to the few exceedingly caducous setæ of the American *Centratheræ*, in *Adenoon* entirely deficient. In all three the involucral bracts are very persistent, quite different from those of the American *Piptocarpha*.

2nd. Divergences in the receptacle.—In the Old World the receptacle rather deeply foveolate and fimbrilliferous, which has served to distinguish the above-mentioned Mascarene section *Distephanus* and the genus *Bothriocline*, a single tropical African species, is but little more than may be observed occasionally in several Vernoniaceæ of other genera, both in the Old and the New World, and even in *Vernonia* itself; in *Distephanus* it seems to be accompanied by some slight difference in habit, in *Bothriocline* by a peculiar involucre, as also by opposite or whorled leaves, a circumstance otherwise unknown in the whole tribe of Vernoniaceæ except in a single Brazilian, otherwise normal, *Vernonia*. In America, among the genera otherwise closely allied to *Vernonia*, the Brazilian monotypic *Albertinia* has the receptacle so deeply alveolate as completely to envelop the achenes; and the Mexican *Bolanosa*, also monotypic, has separate caducous paleæ embracing each floret, with the habit, involucre, and other characters quite those of a *Vernonia* (*Lepidaploa*). Neither of the above characters, however, is of more than generic value, occurring in groups otherwise very far distant from each other. The deeply alveolate receptacle is met with, for instance, in the Helianthoid *Balduina* from North America, and in several South-African Arctotideæ. The deciduous paleæ of *Bolanosa* occur here and there in species or genera of Eupatoriaceæ, Asteroideæ, Senecionideæ, and other tribes usually deprived of them.

3rd. Divergences in the pappus.—The indefinite setæ of the inner or principal pappus of *Vernonia* assume a paleaceous character in several tropical American genera, otherwise nearly connected with *Vernonia* (*Stilpnopappus* and others); whilst in the Old World there is only a slight tendency in this direction, as already observed in some species of the section *Stengelia*, without being there carried further. On the other hand, the same paleaceous pappus prevails generally, though not universally, through the strictly American genera with glomerate capitula to be mentioned presently. This is, therefore, a type much developed in America, but early arrested in the Old World, or an old type which has retained more permanency in the former than in the latter region.

The reduced pappus is common to the New and the Old World, but more frequent and more regularly connected with that of *Vernonia* in the latter than in the former. *Centratherum*, with the setæ exceedingly caducous and usually a peculiar involucre, is common to both regions, but much more marked in America, where it is limited also to one or two species passing into *Oiospermum* without any pappus at all, and never having any near approach to the ordinary pappus of *Vernonia*; whilst in Asia and Africa it is connected by various gradations with *Vernonia*, especially with the section *Cyanopis*, in which also the pappus is frequently deciduous, and does not seem to pass gradually into the African pappusless genera *Ethulia* and *Gutenbergia*. The latter, indeed, especially *Ethulia*, seem to be more nearly connected with *Herderia*, also African, in which the developed pappus has a very different character from that of *Vernonia* and its modifications.

4th. Divergences in the involucre.—These are so great within the genus *Vernonia* itself, that they are scarcely admissible as distinctive generic marks, except when combined with other characters as in the above-mentioned *Centratherum* and *Oiospermum*, or with habit and geographical isolation, as in the Cuban *Lachnorhiza*, to which also I have already referred.

5th. Divergence in the general inflorescence.—A large group of American Vernoniaceæ diverge gradually from the typical *Vernoniæ* in their compound inflorescence—the flower-heads, either 1- or few-flowered, being closely sessile several or many together on a common receptacle, so as to give the whole mass the general appearance of a single capitulum. In *Lychnophora* and most of its allies this change is accompanied by an alteration in the pappus, which is paleaceous as in *Stilpnopappus*; but in *Eremanthus* it passes sometimes almost into that of *Vernonia*, and in *Vanillosmopsis* into that of *Centratherum*, whilst in some *Vernoniæ* and *Piptocarphæ* the few-flowered capitula, sessile in small clusters, further connect the true *Vernoniæ* with the *Lychnophoreæ*. All these modifications are American; the Old-World *Vernoniæ* and groups immediately connected with them show no tendency to the compound inflorescence, although it is there exhibited in several genera belonging to other tribes.

The mere reduction of the number of florets to very few or to a single one, which induced the establishment of the separate genus

Monosis, is now found to take place in so many and so various genera of Compositæ, that it is no longer held to be more than a specific character.

The tribe of Vernoniaceæ is made to include several small groups or isolated species, which, although they have the general characters of the tribe, are not, as far as at present known, connected with the central *Vernonia* group by any gradation of intermediate forms; these are:—

1. *Elephantopus*, somewhat related to Lychnophoreæ, will be further mentioned under the head of American genera with one cosmopolitan species.

2. *Sparganophorus*, *Pacourina*, and *Heterocoma*, three monotypic tropical American genera, connected with each other in inflorescence and in the development on the top of the achene of a prominent ring or cup, either alone constituting the pappus or encircling a pappus of small caducous bristles. The essential characters are truly Vernonian; and some approach to their peculiar inflorescence may be seen in a few species of *Vernonia*, *Piptocarpha*, *Stilpnopappus* &c.; but of the terminal cartilaginous ring the only trace I have observed is in the Old-World *Ethulia*, very different in general character.

3. *Stokesia*, a monotypic North-American genus, stands alone without any near relations. Its remoter affinities are on the one hand with Vernoniaceæ, of which it has the style and anthers, and under which it is therefore classed, and on the other with Cichoriaceæ, which it approaches in its blue almost ligulate and 5-merous although deeply lobed corollas. It is the only genus not Mutisiaceous which shows any such connexion with that very marked tribe.

4. *Corymbium*, a small South-African genus with the Vernonian style; but the habit, involucre, silky-villous achenes, and the pappus are very different from any thing else known in the tribe. No other nearer connexion, however, has occurred to me.

5. *Rolandra* and *Spiracantha*, two monotypic tropical American genera, with very numerous minute 1-flowered capitula, collected in globular head-like axillary clusters, as in some Lychnophoreæ, and perhaps on the whole best placed, as hitherto, amongst Vernoniaceæ, although they have neither the characteristic style nor the corolla of the tribe, showing possibly some connexion, although a distant one, with some American small-flowered Helianthoideæ or Helenioideæ.

2. *Eupatoriaceæ.*

Eupatoriaceæ may be regarded as one large and natural essentially American group or genus in an extended sense of the term; for, multifarious and distinct as it is, some of the last mentioned small groups or monotypic genera of Vernoniaceæ rank as high in the latter respect. Eupatoriaceæ must, therefore, either not be so ancient as some other groups of Compositæ, or some other reason must have interfered with their early dispersion; for although abundant and evidently early established over the whole of temperate and tropical America, from California to Chili and Buenos Ayres, as evidenced by the distinct local generic groups they have formed in North America, in the Mexican region, in the tropical Andes, in Brazil, and in Chili, they are either wholly absent or have not, with the single possible exception to be presently mentioned, produced any distinct species in tropical or transtropical Africa, Asia, or Australia. They are indeed entirely absent from the Australian flora, and would be also wanting in the floras of tropical and southern Africa and tropical Asia, but for three essentially American genera, *Adenostemma*, *Ageratum*, and *Mikania*, which have each one cosmopolitan species, and will be considered hereafter, and for one or two species of *Eupatorium* itself, which from Northern Asia may have penetrated within the tropical limits.

This leads us to the northern and sole connexion of Eupatoriaceæ with the Old World, which may be observed in two genera: —1st, in the wide-spread American genus *Eupatorium* itself, which has in that continent above 400 species, and is represented in the Old World by about 8 or 10 rather variable species, all of one North-American type, although not exactly identical with any one species of that country, most of them from Eastern Asia, one of which extends over the whole of Europe, another (by some considered an extreme variety of an Asiatic one) is scattered over the Mediterranean region, and reappears almost in the same form in the Canary Islands, and another, also near the Asiatic ones, has been found on the Zambesi in south tropical Africa. There is, indeed, such a general family likeness between these Old-World forms and some of their E. North-American congeners, that they may well be imagined to have sprung from some parent race that may have passed over from America, and in the various vicissitudes of their career through the lapse of ages, spreading gradually over a vast extent of territory, disappearing in some places and flourishing and further migrating in others, have become gradually differentiated into species which may scarcely yet be taken as perfected. 2nd, in the genus *Adenostyles*, which has one Californian and two European species, without any known representative in the vast intervening regions of Asia on the one side, or of central and eastern North America on the other. There is no doubt of the generic identity; the Californian species, though quite distinct from either of our European ones, is yet more nearly allied to one of them (*A. alpina*) than the two European ones are to each other. Like many others now confined to America, the genus probably once ranged over a great part of the temperate northern hemisphere, and instead of disappearing from the whole of the Old World, has kept its ground in Europe, becoming extinct in Asia.

It is this same genus *Adenostyles* which alone supplies some sort of link connecting Eupatoriaceæ with any other tribe; for in habit and involucre it shows some approach to some species of *Senecio* (*Cacalia*), although the style and other characters leave no doubt as to its being a true Eupatoriacea.

Eupatoriaceæ, within American limits, have formed a number of genera, groups of genera, or subgenera, more or less local or general, but most of them passing so nearly one into the other as to require little notice for the present purpose. The most remarkable is perhaps the group or subtribe of Piquerieæ, characterized by the anthers truncate at the top, without that appendage to the connectivum so universal in the rest of Compositæ. It comprises 7 genera, with about 30 species, chiefly Western, ranging from Chili to Mexico, with two or three South-Brazilian and three Cuban species; it includes also the above-mentioned *Adenostemma*, to which I shall refer under the head of genera with one cosmopolitan species. This remarkable deviation from the almost absolute uniformity of Compositæ is probably, therefore, of West-American origin, and not ancient enough to have spread into other continents now severed from America. I have not observed it in any other group of Compositæ, although the appendage may be very much reduced in a very few tropical American Helianthoideæ.

The other deviation I would mention is not so important, nor very strictly defined, but purely local. The three genera (or subgenera) *Liatris*, *Trilisa*, and *Carphephorus* form a little North-American group, almost limited to the regions east of the Andes or

Rocky Mountains. Their constantly alternate leaves, their general habit, and, to a certain degree, their corollas, may indicate some approach to the Vernoniaceæ; but their styles and other most important characters are essentially Eupatoriaceous.

3. *Asteroideæ.*

The vast tribe of Asteroideæ is neither so well marked as a whole as Vernoniaceæ and Eupatoriaceæ, nor yet is it well divisible into distinct groups. Nearly the whole of the 90 genera, comprising above 1400 species, pass into each other through exceptional or intermediate forms; and there are species if not genera closely connecting Asteroideæ with Inuloideæ, with Anthemideæ, and with Senecionideæ. Of these four intimately connected tribes, comprising about half the known Compositæ, two, Asteroideæ and Senecionideæ, are cosmopolitan, the two others chiefly Old-World.

The Asteroideæ not being divisible into distinct subtribes, we may for geographical purposes consider a certain number of types with the various divergences from them, and then take up a few comparatively isolated forms. The principal of these types are *Grangea*, *Bellis*, *Solidago*, *Aster*, *Erigeron*, *Conyza*, and *Baccharis*. Six of them are common to the New and the Old World, the first two chiefly belonging to the Old World, the next four more numerous in the New, and *Baccharis* entirely American. The whole tribe affects chiefly temperate or mountain regions of both hemispheres, tropical Asteroideæ being comparatively rare.

1. The *Aster* type.—*Aster*, taken in its most extended sense, ranges over the whole area of the tribe; but isolation has been ancient enough to admit of its having established special forms in different countries, which are now admitted as genera by most botanists. *Aster* itself, as we have limited it, forms a group of about 250 species belonging to the temperate regions of the northern hemisphere, chiefly North American, a very few species rather abnormal descending along the western regions into South America, and a mountain form connected with a European and Asiatic one crossing the equator in Eastern Africa. These true *Asters* are herbaceous, usually perennial, often tall, though some mountain species are quite dwarfed or almost stemless; the involucres are usually broad, the heads heterochromous, the achenes flat, and the pappus copious. Among the modifications observed within the genus as we now retain it which some asterologists

have considered to be in themselves of generic importance, the following are more or less connected with geographical distribution:—

(1) The section *Alpigenia,* ranging over the mountain-regions of the northern hemisphere, and including the above-mentioned transtropical African species, with the achenes and pappus of the typical *Asters,* acquires the habit and involucres and, in some measure, the increased numbers of ray-florets of a corresponding mountain group of *Erigeron* inhabiting the same regions, and thus to a certain degree connects the two genera.

(2) The Andine section *Noticastrum,* consisting, as far as known, of two species only, with a slight modification in the ribs of the achenes, but with the pappus and other essential characters of *Aster,* closely connects the genus with the Andine group of *Erigeron*; whilst the nearly related section *Heterastrum,* also South American and chiefly extratropical, approaches another South-American set of *Erigeron,* even in the pappus, and has been alternately placed in both genera. So, also, the section *Oxytripolium,* with very few species dispersed over North and South America, connects the same set of *Erigerons* with the section *Orthomeris* of *Aster.* This latter section, chiefly differing in the involucre, although present in North America, has been much more developed and become much more varied in Asia.

(3) *Tripolium* and *Galatella* are Europæo-Asiatic forms characterized chiefly by the reduction, sterility, or disappearance of the florets of the ray, towards which there is very little tendency in N. America, although *Galatella* itself is there represented by one species. *Tripolium* is a single very variable species with a peculiar involucre, the ray-florets sometimes abundant and conspicuous, sometimes very few or absolutely none. *Galatella* has the involucre of the section *Orthomeris* (the one most abundant in Asia); but the female florets are usually sterile or have not even a rudimentary style, or in some species are usually entirely deficient. For the latter case the genus *Linosyris* was established; but it has been proved that the Old-World species sometimes acquire the ray and become true *Asters* of the section *Galatella.* The American species associated with *Linosyris* on account of the absence of ray-florets belong rather to the *Solidago* group to be presently referred to.

Close around *Aster* are two small genera belonging geographically to parts of the main region of that genus, and which, even on structural grounds, might perhaps be restored to it as sections,—the N.-American *Sericocarpus* of 5 species, and the Asiatic monotypic *Callistephus*.

Six other genera, not diverging more or perhaps even so much as the above two in essential characters, but with a very different geographical range and apparent origin as well as a distinct habit, have been by several botanists reunited with *Aster*, because they have no distinct character which is not liable to exception. But the species are numerous and the exceptions few; and, geographical considerations coming in aid, it would seem to be more in conformity with the evidences of affinities thus obtained to maintain them as distinct genera. These are:—

(1) The South-African genus *Felicia* (including the greater portion of *Agathea*), about 45 species, much branched shrubs, or, if herbaceous, small annuals branching from the base, all very unlike any American true *Asters*, retaining the achenes but not the pappus of that genus, which is more like that of *Erigeron*, but different from either in its fragility. The very few exceptions in their case consist in one or two eastern species approaching in some respects the alpigenous *Asters* represented in the same country by *A. natalensis*. Closely connected with these *Felicias*, and perhaps not separable, is the monotypic extratropical S.-American *Sommerfeltia*.

(2) The Australian genus *Olearia*, about 85 species, mostly shrubby, like the S.-African *Felicias*, but larger and retaining, not the achene but the pappus of the American *Asters*. This achene is no longer flattened, but terete or nearly so. There is also an occasional tendency to extreme acuteness or even fine points to the auricles of the anthers, never observable in any true *Aster*, but traceable sometimes in another Antarctic or Australasian genus, *Celmisia*, to be presently referred to. The exceptions in this case are a very few Australian herbaceous *Oleariæ*, but with a very different habit from any American *Asters*, and a very few N. American *Asters* (*Bioticæ*) with subterete achenes, but accompanied by a typical American involucre and other characters not to be met with in *Olearia*. These circumstances taken together constitute a much greater difference between *Aster* and *Olearia* than is observable between the alpine *Asters* and *Erigerons*.

(3) The antarctic or subantarctic American genus *Chiliotrichium*, a genus of three species, one of the numerous connecting links between the Australian and the extratropical or Andine S.-American

floras. It is closely allied as well to *Olearia* of the former as to *Diplostephium* of the latter region, differing slightly from both in the presence of a few paleæ on the receptacle.

(4) The South-American Andine genus *Diplostephium*, of about 18 shrubby species, more nearly connected, perhaps, with the Australian *Olearia* than with the American *Asters*, but with a habit and foliage of their own. The achenes are terete or nearly so, not flattened as in *Aster*; and the pappus tends much more than in that genus to the shortening of an outer row of setæ.

(5) & (6) *Commidendron* and *Melanodendron*, two insular genera, the former of three, the latter of a single species, all confined to the island of St. Helena, where they may have been originally differentiated from the ancient type of the group, and, like a few others of the most ancient St.-Helena plants, appear to have retained more of a S.-American (Andine or Western) than of a South-African character. Their nearest connexion is with *Diplostephium*, not with *Felicia*.

2. The *Erigeron* type.—*Erigeron*, taken in an extended sense, has nearly the same geographical range as *Aster*, but without so great a tendency to develop local forms, geographical subgenera, sections, or species. It is also, in point of structural characters, very closely allied to and blending in with *Aster*, touching it at various points, and passing into it more gradually than the above-mentioned semi-geographical genera *Felicia*, *Olearia*, &c.; and yet synantherologists are unanimous in its admission into the ranks of genera of the first order. It passes, indeed, quite as gradually into *Conyza*, and thence into other equally large groups, which, unless we give up all idea of methodizing, must be admitted as very different, although they cannot be strictly defined. This greater blending into allied forms may also not be due to any nearer genealogical affinities, but possibly to greater inherent facilities for propagation, dispersion, and original intercrossing of breeds.

The species of *Erigeron* are in general less distinct from each other than those of the *Aster* type; and most of them are far more widely dispersed; a few also as annual weeds multiply exceedingly wherever they are carried with cultivation, in this respect also agreeing more with *Conyza* than with *Aster*. To distinguish, however, *Conyza* and *Erigeron* from *Aster*, we have but little besides the increase in number and reduction in size of the female florets, which in *Erigeron*, although they have still the corollas produced into a ligula, have that ligula always very narrow, and often short; whilst in *Conyza* these corollas are still further reduced to a filiform tube, shorter than the style, toothed or truncate at the top, the ligula remaining undeveloped. The achenes, also, both in *Erigeron* and *Conyza*, are usually much smaller than in *Aster*, with the pappus much less copious, of finer setæ, usually but not always in a single row.

The same great facilities enjoyed by many species of *Erigeron* for propagation and dispersion increase the difficulty of fixing the geographical origin of some of the sections of which it is composed. *Euerigeron*, ranging from *E. uniflorus* and *E. alpinus* to *E. acris*, belongs to the northern hemisphere, and is chiefly mountainous, passing into the section *Alpigenia* of *Aster*, and may be as much, or nearly as much, of Old-World as of American extraction. *Cœnotus*, the section which passes into *Conyza*, is now pretty nearly cosmopolitan, and, like *Conyza*, overruns tropical as well as temperate regions, the preponderance of local species being African as well as American. The other sections appear to be chiefly or entirely American, and perhaps all of American origin. *Phœnactis*, however, belonging to the northern hemisphere, has two genuine Asiatic species. *Phalacroloma* consists of American annuals, two of which have overrun a great part of the Old World as weeds, like the well-known *E. canadensis*, which is almost intermediate between *Cœnotus* and *Euerigeron*. *Erigeridium* is a single N.-American species of *Euerigeron*, somewhat aberrant in the form of the achene, a deviation which does not appear to go further in any genera of the *Erigeron* group. The South-American sections are rather more distinct and local. *Leptostelma* is a purely Brazilian form, resembling some of the large-flowered North-American species of *Phœnactis*, but with an exceptionally fimbrilliferous receptacle. This also does not connect itself with neighbouring genera. *Oritrophium*, from the Andes, aberrant both from *Aster* and *Erigeron* in the form of the style-branches, in other respects approaches the Andine section *Noticastrum* of *Aster* nearly as much as the northern *Euerigeron* approaches *Alpigenia*; *Oritrophium* assumes also often the habit of the more southern *Celmisia*, but differs in the achene and other characters. *Terranea* (*E. fruticosus*, DC.), from the island of Juan Fernandez, approaches *Aster* in a third direction, being closely connected in many respects with the South-American chiefly maritime *Oxytripolia*.

Around *Erigeron* may be grouped the following slightly divergent genera, designated as much by their geographical areas as by any structural characters, and yet natural enough to be readily recognized:—1. The Antarctic and Australian genera *Pleurophyllum* and *Celmisia*, closely connected with the Andine section *Oritrophium* of *Erigeron*, differ from it chiefly in the shape of the achene, which is more that of *Olearia*, a genus bearing the same geographical relation to *Aster* that *Celmisia* does to *Erigeron*. 2. The Hawaian *Tetramolopium*, an insular group of about half a dozen species, which during its long isolation has, like so many other insular forms, assumed more or less of a shrubby habit. In this respect it is still connected with *Erigeron* through the similarly insular (Juan Fernandez) *Terranea* above mentioned. As to structural characters, *Tetramolopium* has, on account of its subulate style-appendages, been connected by A. Gray with *Vittadinia*; but the latter genus appears to me to be further removed from *Erigeron*. A similar style is observable in the Andine section *Oritropium* of *Erigeron*. 3 & 4. The small Asiatic extratropical genera *Brachyactis* and *Lachnophyllum*, the former with one species extending into North America, both nearly allied to *Aster*, *Erigeron*, and *Conyza*, the species bandied about from the one to the other, difficult technically to distinguish from them, but with a peculiar habit justifying their maintenance as distinct genera, unless the three great types be reunited into a single one. 5. The Asiatic and African *Microglossa*, which, however, may be best considered, with its other relations, under the *Conyza* type.

There are yet two genera connected with *Aster* and *Erigeron*, but rather more clearly distinguished on structural grounds, and to a certain degree supported geographically, both with elongated although still flattened achenes, with the pappus almost that of *Aster*, but with a habit more approaching *Erigeron*: one is *Podocoma*, with five South-American and one Australian species in which the achene is attenuated into a beak, whilst the style is that of *Aster*, but the ligulæ more numerous, like those of the *Aster*-like *Erigerons*; the other, *Vittadinia*, has the flowers of *Erigeron*, or almost of *Conyza*, elongated but beakless achenes, the pappus nearly of *Aster*, and the subulate style-appendages of the section *Oritropium* of *Erigeron*; and with these characters we find species scattered over South America and Australia, as in the case of *Podocoma*, but with the addition of one from the Sandwich Islands.

There are, again, a number of small or monotypic genera ranging geographically around the *Aster* or *Erigeron* groups, which have been in a great measure technically distinguished by slight structural differences, and which in other respects generally correspond to the Asteroid sections or diverging genera of the same respective regions. Thus we have the Asiatic and North-American *Boltonia*, the Asiatic *Heteropappus*, and the N.-American *Townsendia*, *Monoptilon*, and *Psilactis* differing from the typical Asters of the same regions in scarcely any thing but the pappus. The Californian *Corethrogyne* differs rather more in the style and other characters, and may possibly have other connexions. *Eremiastrum* is nearer to *Erigeron*. The Andine *Hinterhubera*, with remarkable irregular corollas to the external female florets, approaches in other respects the South-American *Vittadinia*. The same peculiarity in the corollas characterizes also the genus *Lessingia*, referred, perhaps erroneously, to the homochromous subtribe, and also West-American, though limited to the northern hemisphere. In South Africa, *Amellus*, characterized by the paleæ of the receptacle, and *Mairia* and *Gymnostephium*, by the plumose or reduced pappus, partake in other respects of the Asteroid form characteristic of that region, that of *Felicia*; so also does the monotypic *Charieis*, which in some respects connects the tribe with the Senecionideæ. Finally, three small genera, *Distasis*, *Chætopappa*, and *Minuria*, the two former from W. North America, the latter from Australia, have an abnormal pappus nearly similar in the three, but not much else in common, except as members of the heterochromous group of Asteroideæ; but each will be found to be nearly allied to Asteroid genera of its own country, *Distasis* being comparable with the section *Orthomeris* of *Aster*, *Minuria* approaching in many respects the Australian *Calotis*.

3. The *Bellis* type has a somewhat unusual geographical distribution. It belongs to extratropical western regions of the Old World and to Australia, with one or two representatives in North America; but its principal seat is in Australia. Indeed the European and North-African *Bellis*, with four or five species, the American *Astranthium*, one, or perhaps two, species, the Azorean *Seubertia*, one species, and the South-African *Steirodiscus*, two species, are but very imperfectly distinguished as genera from the Australian *Brachycome*, which has forty species; and amongst slightly diverging genera the European *Bellium* has three species, the North-American (Mexican) *Keerlia* two, the South-African *Garuleum* three, whilst the Australian *Calotis* has fifteen. All these genera may be regarded as more nearly allied to each

other than to any other ones of their own respective countries, although in some respects *Calotis* may be compared to *Minuria*, and *Bellis* itself may be said to approach some Anthemideæ in the Old World, and in the New World, through *Aphanostephus*, to pass into *Egletes* and the more tropical *Grangea* type.

The distinct genus *Lagenophora*, allied on the one hand to the *Bellis* type of Asteroideæ, on the other to the *Cotula* group of Anthemideæ, has a more normal extratropical geographical area, having its chief seat in Australia, but one species extending here and there into S.E. Asia, and allied but distinct representatives being found in Antarctic America and the Sandwich Islands.

The scattered distribution of the *Bellis* type of Asteroideæ and of the closely allied *Cotula* type of Anthemideæ, and the local endemic generic as well as sectional or specific types or races they have both or one of them left in each of the great centres of preservation of Compositæ, the Mediterranean, South-African, Australian, Chilian, and Mexican regions, might suggest the idea of comparative antiquity; and if so, combining its consideration with that of the Helianthoideæ, we might conjecture that in Compositæ the annihilation of the calyx-limb, or its reduction to a small cup or to a definite number of teeth or awns continuous with the ribs of the tube, preceded its development into a setose pappus. Under this view the parent type of the Bellideæ and Cotuleæ would in the Old World have become further differentiated into the tribe of Anthemideæ, whilst in America its development would have been limited to the few nearly allied Grangeoid genera, being otherwise replaced by the more anciently separated Helenioid genera.

4. The *Grangea* type, with usually more numerous and smaller female florets, less compressed achenes, &c. than the *Bellis* type, is much more tropical. It spreads over the warmer regions of Asia and Africa with a few American forms, which latter connect it more immediately with the preceding types. In the Old World it remains as distinct in geographical range as in structural character. A few of the genera, especially *Myriactis* and *Rhynchospermum*, both of which extend rather further north than the others, have the achenes flattened, with nerve-like borders so common in the preceding types, but with the beak of *Lagenophora*. In the remaining genera the achenes are more like those of the Anthemideæ of the *Cotula* type; and, still more than the Bellieæ, the Grangeæ, by their pappus reduced to a small cup or corona or entirely de-

ficient, connect the Asteroideæ with the Anthemideæ. The genera are all small; seven are from the Old World, of which three (*Myriactis* 5 species, *Grangea* 4 species, and *Dichrocephala* 5 species) have a wide range over Asia and Africa; whilst four monotypic ones are local, or nearly so, *Rhynchospermum* and *Cyathocline* being exclusively Asiatic, and *Ceruana* and *Microtrichia* limited to Africa. The two American genera *Aphanostephus*, 3 species, and *Egletes*, 5 species, have not thrown out any immediately divergent genera around them; the connexion of the former with the *Bellis* group and thence with typical *Asters* has been already mentioned. *Egletes* is remarkable in its close resemblance in every respect to the African and Asiatic *Grangeas*, excepting in the single generic character the presence of the ray-flowers, which in Africa are always deficient—a character which in other genera is frequently variable even in one species, but here apparently constant and geographical.

5. The *Solidago* type.—We have here about 320 species in 24 genera, all nearly allied to each other and only distinguished technically from *Aster* and its immediate allies by the homochromous florets, the ray-florets, when present, being yellow, like the disk—a character in general of so little value that it cannot, in *Senecio* for instance, be admitted as of more than specific importance, and yet is here accompanied by so much of habit and certain prevalent, although not absolute, peculiarities, that it is universally acquiesced in, notwithstanding the frequent difficulty in ascertaining it. The erroneous appreciation of colour in dried specimens has led to many mistakes, and there are several groups where the rays are deficient; in these cases it is only by complicated affinities in other respects that the place of a plant can be determined. In general, the rayless species and genera belong to the *Solidago* group; but this absence of ray occurs sometimes even in *Aster* itself; and experience has now shown that the European *Linosyris* and American *Bigelowia*, united by some of the most eminent synantherologists, belong, the one to the *Aster*, the other to the *Solidago* group. And here geographical distribution may be called in aid. The great seat of the group is extratropical America, North and South, with a few intermediate Andine species. The large genus *Solidago* itself is almost entirely North American and extratropical, but represented by one variable species in extratropical South America, and by another at least as variable in the north temperate regions of the Old World,

both these outlying species being identical with, or closely allied to, genuine North-American ones. The other genera (excepting 5 to be presently mentioned) range from California to Chili and Patagonia, with a North-American and chiefly western preponderance, and in South America scarcely extending eastward of the great mountain-chain until the continent narrows in the extreme south. Not one of the group is to be met with in tropical Brazil, Guiana, or the West Indies; not one, besides *Solidago virga aurea*, in Europe, Asia, Northern or Tropical Africa, or in Australia.

The 5 excepted genera comprise 58 South-African species. Of these, 2 continental genera, *Pteronia* with 51 and *Fresenia* with 3 species, are rayless; and one might therefore at first suspect that they may not be correctly associated with a group so different geographically. But the involucre and general aspect are much nearer those of many homochromous than of any heterochromous genera (excepting in respect of the shrubby character so frequently assumed in the region by most Asteroid genera); and there is one monotypic continental genus, *Homochroma*, and two Mascarene ones, *Glycideras* of one and *Rochonia* of two species, in which the ray is, according to all accounts, homochromous and yellow. Moreover the geographical connexion between South Africa, extratropical South America, and the Mexican region is not so anomalous as would at first appear. I shall have to quote instances of it under the general head of extratropical southern connexions between America and the Old World.

With regard to the distribution of the American genera within the general limits assigned to the group, *Solidago*, including its offset *Brachychæta*, with about 80 species, has, as I have already mentioned, only one immediate southern representative. The large shrubby *Bigelowiæ*, which might make a good genus of 4 species, are exclusively Andine. The remaining *Bigelowiæ*, 16 species, *Haplopappus*, about 60 species, *Grindelia* and *Guttierrezia*, about 20 species each, range from Chili to California, but all with more diversified, as well as more numerous, forms in the north than in the south. *Hysterionica*, 5 species, may be considered the southern representative of the northern *Chrysopsis*, 21 species; *Nardophyllum* and *Lepidophyllum*, each of 5 or 6 species, representing the northern *Ericameria* of 4 species, are the only ones which show any southern preponderance. *Xanthocephalum*, with 7 Mexican species, has one in the Andes of Columbia. *Heterotheca*, 5 species, *Pentachæta*, 2 species, and the monotypic genera

Bradburia, *Aphantochæte*, and *Xanthisma*, are exclusively North-American. Philippi's two monotypic Chilian genera, *Steriphe* and *Chiliophyllum*, are unknown to me; and without having examined them I cannot feel certain that they are really forms of the *Solidago* group distinct from any of the above.

6. The *Conyza* type.—This is as intimately blended with the *Erigeron* series as that is with the *Asters*, preserving generally the small flat or narrow achenes and slender uniseriate pappus of *Erigeron*, but with a great reduction in size and increase in number of the female florets, these being shorter than the style, filiform, and truncate, or two- or three-toothed, rarely producing a small scarcely spreading ligula. But all these characters are vague. *Conyza* itself passes, on the one hand, into *Erigeron*, on the other into *Laggera* and *Blumea*, and in a third direction comes very near to *Baccharis*.

The geographical range of the *Conyza* type, however, is somewhat different from that of *Erigeron*; it is much more tropical and chiefly Old-World. *Conyza* itself, with 50 species, ranges over the warmer regions of Asia, Africa, and America; and one or two species, as ready colonizers or weeds of cultivation, extend over the whole area. The allied more local species of this, which may be called the typical form of the genus, are some of them African, some American, without any particular local physiognomy; but amongst the more divergent species in America, *C. triplinervia* and its allies assume a form approaching that of some species of the American *Baccharides*, and *C. gnaphalodes* (*Lænnecia*, Cass.) has the pappus of an American *Erigeron*. In the Old World the principal divergent forms are *Fimbrillaria* and *Dimorphanthes*, each with several species, the former tending towards the Old-World genus *Nidorella*, the latter with an abnormal involucre unknown in this group in the New World.

None of the genera closely diverging from *Conyza* are American. *Haastia*, with 3 species, is its New-Zealand representative. *Thespis* is a monotypic East-Indian. *Nidorella*, *Heteromma*, *Chrysocoma*, and *Nolletia*, comprising together about 28 species, are chiefly extratropical, but South-African, *Nolletia* alone having a representative in North Africa; and *Nidorella* passes into some tropical African and Asiatic species which may almost equally well be placed in *Conyza*.

There remain three or four genera connected in many respects with the *Conyza* group, but also giving indications of other affinities; these are:—1. *Psiadia,* an African and Mascarene genus of about 14 species, with something of the involucres and yellow ray-florets of some of the *Solidago* group; but the ligulæ are as numerous and almost as small as in some of the Conyzoid genera. The glutinous inflorescence of several species recalls some of the South-American homochromous genera, whilst the shrubby habit brings it nearer to an African type; and the constant sterility of the hermaphrodite florets is also chiefly to be found in some South-African and Australian genera of the tribe. 2. *Microglossa,* a tropical African and Asiatic genus, as to which it still remains a doubtful point whether it should be associated with the *Erigeron* or the *Conyza* type. 3. *Adelostigma,* one, or perhaps two, tropical species of a truly African character, but seemingly connecting the *Conyza* type of Asteroideæ, of which it has the tailless anthers, numerous filiform female florets, small achenes, &c., with the true *Inuleæ,* which it approaches in habit and involucre. 4. *Parastrephia,* a single Peruvian species which has been described as a *Baccharis* and as a *Vernonia,* and which Nuttall considered to be anomalous in the whole order in having the female florets in the centre of the head surrounded by the hermaphrodite ones. But in this he was misled by insufficient specimens; and the examination of more perfect ones shows it to be a connexion, as it were, between *Conyza* and *Baccharis,* technically belonging to the former group, but in habit, geographical station, and probably in real relationship much more closely allied to *Baccharis,* where Meyen first placed it.

7 (and lastly). The *Baccharis* type.—This consists of two genera, including above 250 species, which may be loosely defined as more or less diœcious *Conyzas.* Although the florets in the capitula of Asteroideæ show so frequently sexual differences in the same capitulum, it is only in these two Baccharoid genera that there is any unisexuality in the capitula or the individual plants. In this respect they correspond with several Inuloideæ (Plucheineæ, Gnaphalieæ, &c.), but have not the anther-appendages of that tribe; and their geographical position is different. *Baccharis* and *Heterothalamus* are exclusively American and chiefly South-American, where they accommodate themselves to every soil and climate, ranging over the tropical plains, dispersed over the mountain-regions in great abundance, and extending to the extreme south, although not accompanying other Andine and Magellanic genera over to the Antarctic or the Australasian region. They

extend also into North America, but in somewhat diminished numbers and varieties of form, and have not there diffused themselves generally enough, or far enough northward, or early enough, to have spread into temperate Asia. The species are in general comparatively local; and none have shown any of the *Conyza* disposition to become introduced into foreign lands.

There is a small oriental plant, the *Gymnarrhena* of Desfontaines, which technically, from its anthers and style, might be referred to the *Baccharis* group of Asteroideæ; but in habit and natural affinities, as well as in geographical station, it is so near to *Geigeria*, that we are compelled, as it were, to place it among Buphthalmeæ, although exceptional in what we reckon the most essential characters of Inuloideæ.

4. *Inuloideæ.*

The tribe Inuloideæ, not quite so numerous as Asteroideæ, is more varied, the 1150 to 1200 species being easily distributed into 138 genera, or, according to some botanists, nearly double that number; and these again may be collected into 9 fairly distinct subtribes—*Tarchonantheæ*, *Plucheineæ*, *Filagineæ*, *Gnaphalieæ*, *Angiantheæ*, *Relhanieæ*, *Athrixieæ*, *Euinuleæ*, and *Buphthalmeæ*, all more or less geographical as well as structural. As a whole, Inuloideæ belong for the most part to the Old World, and several of the subtribes exclusively so; and the tribe is fairly limited (among heterogamous tribes) by the double character of style-branches without terminal appendages, and anthers with appendiculate or so-called tailed auricles. The exceptional species are very few, and the frontier-lines not very difficult to trace, although in some measure the subtribe Plucheineæ may be said to pass into Asteroideæ of the *Conyza* group, Gnaphalieæ into Senecionideæ, Euinuleæ into Mutisiaceæ, and Buphthalmeæ into Helianthoideæ.

Of the above subtribes, the second, third, and fourth, though most numerous in the Old World, range also over the New; the other six are limited to the Old World. The first and sixth are exclusively South-African, the fifth almost exclusively Australian, the seventh South-African with one or two more northern species, the eighth and ninth African, European, and rather more sparingly Asiatic. We will take the subtribes, however, rather in their systematic than in their geographical sequence, commencing with the tribes in which the female florets, when present, are filiform, not ligulate.

1. The TARCHONANTHEÆ are placed first, as having their diœcious character in common with the Baccharideæ (the last subtribe of Asteroideæ), which they may in that respect be said to represent in South Africa; and the hermaphrodite florets being constantly sterile, their styles are the same in both cases; but there is no direct connexion between the two. The habit and the anthers are as absolutely different as the geographical situation, besides that, in Tarchonantheæ, the form of the style-branches of the female florets is a greater departure in shortness and breadth from the almost uniform slender shape than I have met with elsewhere in the order. The subtribe consists of two genera and nine species, all strictly South-African, to which should probably be added the Mascarene *Synchodendron*, of which the sterile flowers alone are known.

2. PLUCHEINEÆ. The genus *Pluchea* in an extended sense might include *Blumea*, *Sachsia*, *Rhodogeron*, and *Tessaria*; and, indeed, the whole subtribe show the filiform female florets, small achenes, and slender pappus of the *Conyza* group of Asteroideæ, but with the Inuloid anther-tails, the styles without terminal appendages, and usually drier involucral bracts, and a few other features rather different from those of *Conyza*. The various genera proposed or adopted depend chiefly upon differences in the pappus and other individual characters, and are more or less artificial and not always geographical. The nearest to *Conyza* is *Blumea*, strictly confined to the tropical and subtropical regions of the Old World and mainly Asiatic. It consists of about 60 species of varied habit, ranging from that of *Conyza* to *Pluchea* itself. Several species, widely diffused tropical Asiatic weeds, very difficult to distinguish from each other, only differ from *Conyza* in their anthers, whilst in the closely allied African and Asiatic genus *Laggera*, of about ten species, these anthers even lose their tails; but these species are in their styles and other respects quite removed from *Conyza*, and belong to a group intermediate, as it were, between *Blumea* and *Pluchea*. Notwithstanding, therefore, any such exceptional forms which interfere with accurate technical characters, I believe there is never any difficulty in distinguishing at once any Inuloid *Laggera*, *Blumea*, or other Plucheinea from any Asteroid of the *Conyza* group.

Pluchea, less varied in form than *Blumea*, and far less numerous in species, is yet far more extended in geographical range; and as it has established endemic species in different parts of its area, several of these have been raised into monotypic genera, sometimes with so much of the common habit and character that we have thought it illogical to adopt them; others are retained with some hesitation. The genus, as a whole (about twenty-five species), differs from *Blumea* in the corymbose inflorescence, in the disk-florets generally (though not always) sterile with undivided styles, and usually in the broader more coriaceous involucral bracts. It is nearly equally distributed over America, Africa, and Asia, chiefly within the tropics, but extending somewhat northwards both in America and Asia, and sparingly to the south of the tropic in Australia. No one species is common to the New and the Old World; but the commonest species of the two hemispheres are about as near to each other as each is to the other species of its own region.

The Old-World genera, chiefly monotypic, separated by characters which we would consider as no more than specific, are:—1. *Berthelotia*, an East-Indian species which had been removed from the neighbourhood of *Pluchea*, chiefly on the mistaken supposition that the anthers were not tailed. It has also been characterized by the setæ of the pappus being more or less connate at the base; but that is also observable, though in a less degree, in the common *Pluchea indica*. 2. *Karelinia*, a Caspian species with a narrower involucre and a long white pappus, the setæ of the disk-florets mostly thickened at the apex, as is so often the case where the florets are sterile. This also had been erroneously presumed to have tailless anthers. 3. *Oligocephalum* may be given as a sectional name for *P. pinnatifida*, Hook. f., from tropical Africa, and *P. frutescens*, Benth., from Scinde, small shrubby species which in some respects form, as it were, a passage into *Blumea*, but are, on the whole, nearest allied to *Pluchea*; whilst the *Laggeras* above mentioned, intermediate in another direction, have the inflorescence and chief characters of *Blumea*, with the involucre rather of *Pluchea*—and having, in addition, no tails to the anthers, are retained as a distinct genus. 4. *Spiropodium* is an Australian species with the capitula generally, but not quite constantly, diœcious, a tendency to which arrangement is also observable occasionally in the African *P. Dioscoridis* and some others. The Australian *P. tetranthera*, which is also nearly diœcious, diverges further in its tetramerous sterile florets and in the inflorescence tending towards that of *Monarrhenes*. 5. *Eyrea*, with three species, all Australian, is a form diverging in another direction, in its broader or hemispherical, often solitary, capitula and narrower involucral bracts, but apparently better placed as a section of *Pluchea* than as a distinct genus.

In America three small genera, scarcely more divergent from *Pluchea* than some of the foregoing, but each with a very special geographical range, may still be kept up as distinct; these are:—1, *Sachsia*, three Cuban species more distinct from *Pluchea* in habit than in character; 2, *Rhodogeron*, a single species, also from Cuba, with the female florets almost ligulate, an exception to the whole subtribe; and, 3, *Tessaria*, five species limited to western temperate or Andine America from Chili to California, has not the tropical geographical character of *Pluchea*, but is closely allied to the less tropical Asiatic forms of *Pluchea* both in habit and in character, whilst in indumentum and in the consistence of the involucral bracts it shows some approach to the Gnaphalieæ. *Stenachænium*, consisting of two or three Brazilian species, although hitherto included in *Pluchea*, is much more distinct than any of the foregoing, especially in its long achenes, exceptional in the subtribe.

Two Old-World forms of limited geographical range diverge rather more prominently from *Pluchea*, to which they bear, nevertheless, much general resemblance—*Pterigeron*, five Australian species, and *Nanothamnus*, one East-Indian species, both with anomalous corollas, the former showing an approach to those of some Athrixieæ, the latter to those of Mutisiaceæ. This Asiatic monotypic genus, with two equally monotypic Australian genera, *Thespidium* and *Coleocoma*, unite the Pluchean involucre and flowers with a much modified, reduced, or evanescent pappus; and the latter two Australian plants have, moreover, a very peculiar habit and inflorescence.

Epaltes, a genus of about nine species, is spread over the same wide tropical and subtropical area as *Pluchea* itself. With the essential characters of the subtribe Plucheineæ, it bears a general resemblance, in habit and pappusless achenes, to the Vernoniaceous *Ethulia*, with which genus it has often been confounded through a total neglect of the principal floral characters. The genus as a whole is a very natural one, although the species of each region have been raised into separate genera upon characters which scarcely deserve more than a specific rank. Thus *Pachy-*

thelia, Steetz, comprises two American species (of which one, *E. brasiliensis*, is also African), *Litogyne* four African species, the original *Epaltes* a single Asiatic one, and *Sphæromorphæa* (*S. petiolaris*, DC.) and *Ethuliopsis* (*Gynophanes*, Steetz) each a single Australian species. In the last-named species the capitula, as has been observed as to some Australian *Plucheæ*, are almost or quite diœcious.

Denekia is a curious little South-African genus of two, or perhaps three, closely allied species, with the anthers of Plucheineæ, but in habit and some other characters approaching rather *Nidorella* amongst Conyzoid Asteroideæ, and forming one of the strongest links between the two tribes. The pappus is unlike that of any genus of either subtribe.

Sphæranthus, *Pterocaulon*, and *Monarrhenus* form a small tropical or subtropical group with the main characters of Plucheineæ, but with the small glomerate capitula so prevalent in Filagineæ, Angiantheæ, and Relhanieæ. *Sphæranthus* (ten species) belongs exclusively to the Old World; *Pterocaulon* (eleven species) is also American; both are more prevalent in Asia and tropical Australasia than in Africa; *Monarrhenus* (three species) is exclusively Mascarene. The three genera, though closely allied, are fairly distinguishable. From the American *Pterocaulon* the Australasian species have been usually considered generically distinct, under the name of *Monenteles*, characterized by the solitary disk-florets; but the two genera, established without reference to each other at about the same time, had never been fairly compared, and the supposed differential character is now no longer in accord with geographical distribution; for the Brazilian *P. spicatus* has the solitary disk-florets and glabrous receptacle of *Monenteles*, whilst the Australian *M. sphacelata* has two or three disk-florets, as in the majority of American *Pterocaulons*.

3. FILAGINEÆ. The majority of the genera here included form a very natural group closely allied to Gnaphalieæ as to the principal characters, but with the disk-florets most frequently sterile with undivided styles as in so many Plucheineæ, and specially distinguished from both by their capitula usually small and glomerate almost as in Angiantheæ, and by the paleæ subtending or enclosing the female florets, or at least the outer ones. The seven genera we have adopted, comprising about forty species, range over the temperate regions of the northern hemisphere, scarcely penetrating within the tropics, several of them common

weeds in the Old World; the American species chiefly western and extratropical both in North and South America. The three principal genera, *Evax*, *Micropus*, and *Filago*, are chiefly Old-World, but represented also by a few species in Western America; the sections *Acantholæna* and *Bombycilæna* of *Micropus* belong, however, exclusively to the Old World; and the section *Stylocline* of *Micropus*, with the nearly allied genera *Psilocarphus*, *Diaperia*, and *Micropus*, are limited to California or Chili, or both. The somewhat more divergent genus *Ifloga* (*Trichogyne*, DC.) has a very different geographical area, being chiefly South-African, with one representative in the Mediterranean region.

Three genera with many of the technical characters of Filagineæ, but with a very different habit and geographical range, are not, perhaps, properly included in the subtribe, or at the most should only be considered its tropical considerably modified representative. These are *Cylindrocline*, with one Mauritian species, and *Blepharispermum* and *Athroisma*, which together include four from tropical Asia or Africa. Their larger black achenes and reduced paleaceous or deficient pappus seem to bring them nearer to the Buphthalmeæ; but the receptacular paleæ covering the filiform female florets are characteristic of Filagineæ. They thus form an isolated group which would be still more out of place in any other tribe or subtribe with which they might be compared.

Petalacte, a single South-African species, is another ambiguous genus which, technically, would be placed among Filagineæ, but, from its habit, geographical, and some other characters, may be better considered as an exceptional Helichrysea next to *Anaxeton*, which it so closely resembles.

4. GNAPHALIEÆ, a very large subtribe, distinguished from Plucheineæ chiefly by the scarious, or coloured, and radiating involucres, may be divided into two groups or large natural genera, *Eugnaphalieæ* and *Helichryseæ*, the one of about 200, the other of about 400 species, closely allied to and, as it were, passing into each other, insomuch that some botanists have united into one the two typical genera *Gnaphalium* and *Helichrysum*, but distinguished with few exceptions (chiefly tropical African) by a general character of some importance, the female florets outnumbering the others and usually exceedingly numerous in the Eugnaphalieæ, few, or disappearing altogether, in the Helichryseæ; and the geographical distribution is different. Eugnaphalieæ range over the whole world, forming only small distinct groups in

local areas; Helichryseæ are, with few exceptions, limited to South Africa, Australia, and the Mediterranean region of the Old World.

The delimitation and subdivision of the genus *Gnaphalium* has much puzzled all synantherologists, and is still in a very unsatisfactory state. Among the species now generally admitted to belong to it are some which by Lessing and De Candolle were established as a genus of Mutisiaceæ; and the differences observable, whether in habit or structure, are not much in accord with the geographical distribution. The genus as a whole is cosmopolitan, though rather more temperate or mountainous than tropical; and the two principal groups into which it might be divided as to habit inflorescence and involucres, represented, for example, by *G. polycephalum* and *G. uliginosum* respectively, are both to be found over the same area; whilst *G. luteo-album*, which closely connects the two groups, is ubiquitous. Weddell proposed the division into two genera founded on the pappus, of which the setæ are quite free and separately caducous in *Gnaphalium*, united at the base in a ring and falling off altogether in *Gamochæta*: and this appears at first sight very plausible, and accompanied by some difference in the involucre; but upon further investigation it is found to separate species like *G. purpureum* and *G. indicum*, so closely allied that they are found mixed together in most collections, whilst it unites into one genus *G. polycephalum*, *G. lavandulaceum*, and *G. uliginosum*, species evidently the most remote in affinity of the whole series. It would seem, therefore, that Weddell's divisions can only be taken as somewhat artificial sections, and that if we attempt any more natural although vaguely characterized groups we must recognize three as very generally diffused, those above-mentioned as typified by *G. polycephalum* and *G. uliginosum* with the intermediate *G. luteo-album* under *Eugnaphalium*, and that exemplified by *G. purpureum* and *G. sylvaticum* under *Gamochæta*, and about five other groups confined to special geographical areas:—1, two or three Andine species (Mexican or South-American) belonging to *Eugnaphalium*, but remarkable for their involucral bracts radiating as in *Chionolæna*, which they also resemble in habit; 2, *Lucilia* (including *Belloa*), a Chilian or south Andine group, differing from other *Gamochætæ* chiefly in their longer narrow involucres; 3, *Merope*, dwarf tufted or prostrate Andine plants, with the involucral bracts more spreading after flowering than in *Lucilia*, to which A. Gray unites them; 4, *Omatotheca*, a Europæo-Asiatic and North-American Alpine plant, dwarf like the *Meropes*, with the involucre of a *Gamochæta,* but the pappus of a *Eugnaphalium*; and, 5, *Anaphalioides,* a remarkable New-Zealand group of two or three species, with the spreading involucres of *Anaphalis,* and in sexual arrangements connecting that genus with *Gnaphalium.*

With regard to the groups so much further divergent from *Gnaphalium* as to have been retained as distinct genera, one, *Achyrocline* (fifteen species), is common to the New and the Old World; like many tropical-American (chiefly Brazilian) genera it has two or three representatives in tropical Africa. It is nearest, on the one hand, to the corymbose group of the section *Eugnaphalium,* but with narrow few-flowered capitula more densely corymbose, a *Helichrysum*-like involucre, &c.; and, on the other hand, to *Stenocline* among Helichryseæ, of which it has the aspect, but with the Gnaphalioid sexual proportions. Nearly allied to it is the monotypic tropical-African *Chiliocephalum* without any pappus.

Chevreulia and *Facelis* are two small South-American Andine or extratropical genera connected with the *Lucilia* series of *Gnaphalium* of the same region, but differing, the one in the long beak into which the achene is produced, the other in the plumose pappus. *Lasiopogon,* from extratropical Africa south and north, and from the latter extending into the Levant, is another small genus, differing from some of the smaller *Eugnaphalieæ* and *Filagines* of the same region in the plumose pappus. *Phagnalon* has a dozen species from the Mediterranean region more isolated in character. The anthers are often almost or quite tailless; and the species were indeed formerly included in *Conyza*; but their involucres, habit, styles, and the anther-tails of some of the species justify their having been removed to Gnaphalieæ.

All the above genera have the disk-florets usually fertile as well as the females; in the following eight or nine genera, so nearly connected with *Gnaphalium* that they have most of them been united with it by some authors, the disk-florets are almost universally sterile and often with undivided styles. *Chionolæna* is Brazilian, allied in other respects to the American *Gnaphalia* with radiate involucres. *Luciliopsis* is Andine, near the Andine *Gnaphalia* of the section *Lucilia.* *Tafalla* is also Andine, but more tropical, and in its habit and diœcious capitula connected with some species of *Baccharis* of the same country, but with the Gnaphalioid involucre, anthers, &c. *Mniodes,* again, another high-

Andine small genus with diœcious capitula, corresponds in other respects with *Merope*, also high-Andine. *Antennaria* and *Leontopodon* are mountain genera connected with the smaller *Eugnaphalia*, dispersed over Europe, Asia, North America, and the Andes of South America. *Anaphalis*, allied on the one hand to *Antennaria*, on the other to the corymbose *Eugnaphalia*, is intermediate between the two as to sexual characters, and differs from both in the usually radiating involucres. It is more Asiatic than any of the other genera, being represented in North America by only a single species out of about twenty-five. *Stuartina*, *Demidium*, and *Amphidoxa*, three monotypic genera from Australia, Madagascar, and South Africa respectively, are allied in habit to the small glomerate *Eugnaphalia*; but, besides the frequent sterility of the disk-florets, they differ in the pappus reduced to a very few setæ in *Amphidoxa*, entirely deficient in the other two.

There remains only *Raoulia*, an Australasian mountain genus of fourteen species, chiefly from New Zealand, which may be said to be almost strictly intermediate between Eugnaphalieæ and Helichryseæ, the proportion of the female and disk-florets being variable and often nearly equal, but certainly with a Eugnaphalioid tendency both in that and in habit.

Helichryseæ present one of those instances (such as Proteaceæ, Restiaceæ, &c.) in which a large very natural group of plants had spread over two regions, South Africa and Australia, now quite isolated, but then possibly in connexion with each other, in times sufficiently remote for them to have diverged in each region into different forms, and have multiplied greatly in both, without having preserved a single species in common. The Helichryseæ, however, have retained a closer affinity than the larger groups above mentioned. The South-African Ericaceæ have only a representative order or suborder in Australia (Epacrideæ); Proteaceæ and Restiaceæ have tribes but no genera in common; among Helichryseæ there are common genera and even sections, but no species.

Helichrysum itself, the largest genus of the subtribe, has, out of about 260 species, 137 South-African and about 60 Australasian (chiefly Australian with a few from New Zealand), and in each country has established distinct sectional races. The subgenus *Lepicline* is wholly South-African, as are also several sections of *Euhelichrysum*; others of these are exclusively Australian; but the sections *Xerochlæna* and *Ozothamnus*, although chiefly Australian, have a few African representatives; for many groups of the former have been found in South Africa, and a few species referable to the latter in Madagascar. The genus extends also into North Africa, Europe, and Central Asia—that is, into the Mediterranean region taken in a very extended sense. All these northern species belong to the section *Stœchas,* also represented in South Africa, with two monotypic exceptions: one is *Cladochæta,* which, however, might well be included in *Stœchas,* although De Candolle generically removed it on account of the setæ of the pappus being more or less united in bundles; but the little value of this character is shown by its occurrence likewise in other species, as, for instance, in the Australian monotypic section *Acanthocladium,* which has the habit of the tropical-African *H. spinosum* and *H. horridum,* neither of which has the same pappus. The other exception includes *H. frigidum,* Willd., and *H. virgineum,* DC., dwarf alpine species, only known, the one from the mountains of Corsica, and perhaps of Lebanon, the other from Mount Athos in Greece, both very unlike any other species growing north of the equator. The radiating involucres are those of the southern *Xerochlænæ*; and the whole plant has much outward resemblance to the New-Zealand *H.* (*Gnaphalium,* Hook. f.) *prostratum* and *bellidioides,* but with the densely silky-villous achenes of several *Heliptera.*

Helipterum cannot well be called a good natural genus, but rather a collection of local South-African or Australian subgenera or sections, retained as a distinct group rather for convenience' sake, and solely founded on the artificial character of a plumose pappus; and even that fails to draw a distinct line separating it from some species of *Helichrysum.* It is much more Australian than African; for of 42 species, 30 belong to the former region, and 12 to South Africa; it is in Australia also that it blends most with *Helichrysum*; in South Africa the two genera are more distinct. We have, in the 'Genera Plantarum,' characterized four sections, of which one small one, *Syncarpha,* with two species, is South African, two, *Pteropogon* ten species and *Monencyanthes* seven species, are Australian; the principal one, *Euhelipterum,* is common to both regions, although even here there is a slight difference; the majority of the Australian *Euheliptera* have radiating involucres, which are exhibited only by very few of the South-African species.

Stenocline is a small genus of a more tropical character than any others of the Helichryseæ, and the only one common to the New and the Old World. It has eight species, of which six are Mascarene and two Brazilian. It is very nearly allied to *Helichrysum* itself, but still nearer, in many respects, to the tropical African and American *Achyrocline*, although the sexual relations place the two in different divisions of *Gnaphalium*. Gardner's genus *Leucopholis* has two Brazilian species very closely allied to *Stenocline*, with the habit, however, of the American *Chionolæna*, and differing from both chiefly in inflorescence, the few-flowered heads being closely sessile, and collected in a globular cluster or compound head, as in the Angiantheæ.

The remaining genera of Helichryseæ require but little notice to their geographical distribution; they are all limited to South Africa or to Australia, without any of the forms sufficiently similar in their divergences in both countries to be considered representatives; for the diverging characters are differently combined in the two regions. They are chiefly characterized by the involucres and pappus. South Africa has six of these genera, comprising sixteen species; South Australia sixteen genera, comprising forty-eight species. Among the latter I may particularly mention *Millotia* and *Quinetia*, both monotypic, as connecting in some measure the Helichryseæ with the Senecionideæ, having the peculiar almost uniseriate involucre so rare in Inuloideæ, generally so frequent in Senecionideæ. Among the South-African genera the monotypic *Phænocoma* is remarkable for the foliage, which is that characteristic of the *Relhanieæ*; but the filiform female florets and the broadly radiating involucres are rather those of Helichryseæ.

5. The ANGIANTHEÆ proper constitute a group of eight genera and about sixty-four species, exclusively Australian, and, with the exception of two New-Zealand species of *Craspedia*, limited to Australia itself. With a Gnaphalioid habit and connexion, they are further removed from *Gnaphalium* itself than the Helichryseæ, the capitula being always homogamous without any female florets whatever; the small closely aggregate capitula are also to be met with in some Filagineæ; but in the latter tribe there are always female florets embraced by the receptacular or involucral paleæ. And, geographically, the Filagineæ are entirely wanting in Australia, the fatherland of the Angiantheæ.

Cæsulia, a monotypic East-Indian genus, stands alone. Its essential characters are indeed those of Angiantheæ; but its habit, its country, and several points of structure show but a remote affinity with any Australian genus of that subtribe.

Eriosphæra, a monotypic South-African genus which I only know from Harvey's figure and description, might also be technically referred to Angiantheæ, where, indeed, it may be regarded as a South-African representative of the Australian *Gnaphalodes*. It also bears much resemblance in outward aspect to the South-African *Lasiopogon*, but has no female florets and a very different pappus.

6. Relhanieæ. The Inuloideæ have now taken leave of America; the remaining subtribes with the capitula radiate (when heterogamous) are all African, European, or Asiatic, very sparingly and anomalously represented in Australia. We have seen that the Inuloid genera with the greatest profusion of filiform female florets with exserted styles, Plucheineæ and Eugnaphalieæ, supply not only the most widely diffused genera and species, but also those which have most readily established local subgenera or diverging genera in both the New and the Old World. The Helichryseæ with few female florets have scarcely spread into or maintained themselves in America, whilst the Angiantheæ, without any, have remained within their own limited areas. Nor do the tribes with ligulate female florets appear to have been more successful than those which are strictly homogamous. Possibly the greater facilities enjoyed by the disciform over the radiate races for fertilization and for dispersion, resulting from the peculiar structure and mutual arrangement of the male and female florets and fruits, may have had some effect on their extended distribution; but it is difficult to appreciate the effects of each one of the numerous more or less counteracting influences which have at various times acted on the dispersion, establishment, restriction, or extinction of genera and species in different regions. Strictly diœcious Inuloideæ and other Compositæ certainly appear to have been less successful in spreading than those with androgynous capitula, where structure &c. is otherwise similar. The African Tarchonantheæ cannot well be considered close representatives of the American Baccharideæ; the smaller diœcious genera have not a wide range, with the exception of *Antennaria*, where other influences, resulting from alpine station, may have come into play.

Whatever, therefore, may have been the cause, these three Inuloid subtribes, in which the female florets, when present, are always ligulate, are absent from America, and are mostly, although not entirely, extratropical, and, generally speaking, of very limited areas. The Relhanieæ (fourteen genera and near one hundred species) are exclusively South African, or sparingly represented in the Mascarene Islands. They are in many respects so closely connected with the *Helichryseæ* of the same region as to make it sometimes difficult to determine to which subtribe a genus should belong. Thus *Metalasia* and *Lachnospermum,* having no female florets in any of the species known, might equally well belong to either subtribe, but that they have the peculiar foliage of Relhanieæ, concave or tomentose on the upper instead of the under side, unknown in any other subtribe of Inuloideæ, excepting perhaps *Phœnocoma,* another genus, like *Metalasia,* rendered ambiguous by the absence of female florets, but which, notwithstanding its Relhanieous foliage, seems, in involucre and other characters, to have more affinity with Helichryseæ.

Some Relhanieæ have the one- or few-flowered aggregate capitula of the Australian Angiantheæ, but accompanied by a strictly South-African, not Australian, combination of habit, foliage, and other characters, showing the affinity between the two subtribes to be distant.

The individual genera of Relhanieæ, distinguished chiefly by the aggregate or separate flower-heads, or by the various pappus-forms, afford nothing special to remark upon, as far as hitherto observed, in respect of geographical distribution, all being confined to the same limited area.

7. ATHRIXIEÆ. This subtribe, although still chiefly South-African, is not so local in geographical distribution, and more varied in structure than the Relhanieæ. The Athrixieæ are at once distinguished from the Relhanieæ by the foliage, from Euinuleæ by the style, and generally from both in habit. The genera, however, require separate consideration; for they are not so blended into each other as most of those of the preceding subtribes.

Athrixia itself, with fourteen species, is represented in South Africa, Madagascar, Abyssinia, and Australia, although in no case by identical species in any two of these regions. Four of the five Australian species form a local section distinct from the African ones, and which has indeed been raised into two genera, but properly reduced to *Athrixia* by Asa Gray. The fifth Australian species, however (*A. aculeata,* Steetz, or *Asteridia,* Lindl.), is nearer in structure and habit to the typical *A. capensis* than to any of its own fellow-citizens; and the single Madagascar species seems in some measure to connect the two Australian types. *Antithrixia* and *Arrowsmithia* may be considered as somewhat divergent forms of or offsets from *Athrixia*, both of them South-African—*Antithrixia* represented also by one species in Abyssinia, *Arrowsmithia* monotypic and local.

Leyssera, with three South-African species, is the only genus of Athrixieæ which has a representative (not, however, specifically identical) in North Africa. Although of a perfectly distinct structural type from that of *Athrixia*, it is not, nevertheless, at all more intimately connected with any other Inuloid genera, whether Euinuleæ or Buphthalmeæ, which have a similar geographical distribution.

Macowania, of a single species, and *Heterolepis*, with three species, are both limited to South Africa, and form very distinct genera, although generally connected with Athrixieæ. The last-mentioned, *Heterolepis*, has hitherto been referred to Arctotideæ, of which it has neither the habit nor the achenes, pappus, or style, perhaps from an undue appreciation of the value of the scarious involucral bracts, which, however, is more or less observable in *Leyssera* and other truly Athrixious genera.

Podolepis is a very distinct Australian genus of a dozen species, remarkable for the irregular and varied development of the corolla of the female florets. It establishes in this respect, as also in the habit and involucres of some of its species, a connexion between some Australian forms of *Athrixia* and *Helichrysum* respectively. We have here a relationship, established by structural peculiarities and confirmed by origin as presumed from geographical distribution, between species such as *Athrixia australis* and *Podolepis rutidochlamys*, which might readily, on a hasty inspection, be referred the one to *Asteroideæ*, the other to *Helichrysum*.

8. EUINULEÆ, 19 genera and about 120 species, are so nearly connected with each other, that, with the exception of two or three rather more distinct monotypic forms, they might be considered as constituting a single large genus. Nearly half the species are still retained in the genus *Inula*; and the genus *Pulicaria*, for instance, including one half of the remaining species, although constant in its character derived from the pappus, is probably really less distant from some *Inulæ* than are the two sections *Bubonium* and *Cappa* from each other, although these are regarded by all botanists as congeners.

Taken, therefore, as a whole, Euinuleæ differ from Athrixieæ in the style, and generally in habit, involucres, and other minor characters, and in a more northern geographical distribution. They have some outward resemblance to some American Asteroideæ of the *Solidago* group (*Haplopappus inuloides, Chrysopsis, &c.*), but with very different styles and anthers and a wide geographical severance, and are rather more nearly connected in structure and station with a few genera of Mutisiaceæ, amongst which one genus (*Printzia*) has been recently placed; but their real affinity, structural and geographical, and therefore presumedly genetic, is with Athrixieæ on the one hand and Buphthalmeæ on the other. They belong exclusively to Europe, Asia, and Africa; their chief centre appears to be the great Mediterranean and Oriental region; but they extend southward into South Africa, where they have established a few small local genera, and eastward to the tropical and subtropical extreme east of Asia, although not enough to the north-east to have passed into North America. In Asia they may be said to be partially replaced by allied Mutisiaceous genera; and the South-African genus *Printzia,* five species, has been, as above-mentioned, hitherto actually referred to Mutisiaceæ, although without the essential characters of that tribe, and to our eyes having a close affinity with the Inuloid genus *Iphiona.* Neither in Australia nor in America is there any genus of Euinuleæ, nor yet of any nearly allied Mutisiaceæ. The North-west American *Luina,* with a deceptive aspect of some species of *Inula,* proves, when examined, to be as different in structure as the *Inula*-like Asteroideæ above mentioned, but in this instance to belong to Senecionideæ.

Of the separate genera, the two principal ones above mentioned, *Inula* and *Pulicaria,* range generally over the greater part of the area of the subtribe, and are, besides the two species of the Mediterranean *Jasonia,* which may almost be regarded as a section of *Inula,* the only ones which extend to Europe. The next numerous genus, *Iphiona* (12 species), has still a wide range from the Levant to east tropical and South Africa. *Codonocephalum* and *Amblyocarpum,* two nearly allied monotypic genera, are limited to the Levant; *Grantia,* with four species, is in that region and in Algeria. *Allagopappus* and *Vieræa,* both monotypic, belong to the Canary Islands, where are also some rather peculiar species of *Inula.* *Vicoa,* with five species, is more tropical both in Asia and Africa. *Calostephane* and *Porphyrostemma,* both monotypic, are also tropical, but African only. *Pegolettia* has one tropical and two South-African species; *Bojeria* one Mascarene and one South-African; and, lastly, *Printzia,* with five species, *Homochæte,* with one species, and the two monotypic genera unknown to me, *Minurothamnus* and *Cypselodontia,* are South-African. Among all the above forms *Porphyrostemma* is the most exceptional, having the purple, narrow, linear, very numerous ligulate corollas of *Erigeron,* with all the essential characters of Euinuleæ. All the other genera are homochromous.

There remains the somewhat anomalous genus *Carpesium,* with four or five species, which in its tubular female florets connects *Euinuleæ* with *Plucheineæ,* but, upon the whole, is best placed in the former subtribe. Its geographical area is within the chief range of Euinuleæ, South Europe and temperate and tropical Asia.

9. BUPHTHALMEÆ. The subtribe Buphthalmeæ, sixteen genera, but scarcely above fifty species, allied to Euinuleæ, has a nearly similar geographical distribution, somewhat more restricted eastward, and offers some exceptions. Buphthalmeæ are chiefly African, European, and Oriental. Their structural connexions are more general than those of the other subtribes of Inuloideæ, their styles the same as in Euinuleæ in the North-African and European genera, like those of the Athrixieæ in some exclusively South-African forms; and their tailed anthers and alternate leaves leave no doubt as to their place in this tribe; but in their rigidly paleaceous receptacle, the nature of the pappus in several genera, and some other respects they point to some connexion with Helianthoideæ. The supposed affinity to Asteroideæ appears more remote, and can only have been suggested by the numerous narrow yellow ligulæ of some genera. Amongst themselves, the genera, although small, are more distinct than most of those of the preceding subtribes. Of the seven most nearly connected with each other, three were long united under *Buphthalmum*; but two of the others have been hitherto placed in very different tribes, owing to inattention to the anther-tails, and also to the supposition that there were no Buphthalmeæ in South Africa. As it now stands, *Buphthalmum* is reduced to four species exclusively European: *Odontospermum* seven species, and *Pallonis* one species, formerly included in *Buphthalmum,* belong to the Mediterranean region generally, the former extending to the Canarian and Cape-Verd Islands; but *Callilepis,* two South-African species, *Sphacophyllum,* one Mascarene species, and *Anisopappus,* two

tropical species, appear to me to be quite as near, if not nearer, to *Buphthalmum* than *Odontospermum* or *Pallenis*, although *Callilepis*, for the reasons above stated, had been placed by De Candolle in his subtribe Helenieæ of Senecionideæ, and *Sphacophyllum*, included by him in the Helianthoid genus *Epallage*, referred by him to Anthemideæ. The two species of *Anisopappus* are both tropical African—one from western Africa, published by J. D. Hooker as a *Buphthalmum*; the other, only recently found by Colonel Grant in east tropical Africa, and undoubtedly indigenous, proves to be identical with a long-known South-Chinese plant published under the present generic name by Hooker and Arnott. It has never been found in any intervening district, and the most careful examination can detect no difference in the specimens from those widely distant regions—a case analogous to, but more remarkable than, that of the *Eupatorium* which connects east tropical Africa with north-eastern India.

The monotypic Oriental *Chrysophthalmum* is also very near *Buphthalmum*; but the female florets are deficient, and the habit is more that of *Amblyocarpum* among Euinuleæ.

Rhanterium, an Algerian genus of two species, and *Anvillea*, also of two species, one Algerian the other Oriental, are remarkable for their involucres becoming subglobose and often spinescent, like those of so many Cynaroideæ; but their other characters, and even the habit, on a closer investigation point out their close connexion with Buphthalmeæ. *Ondetia*, one species, from southern subtropical Africa, is another form of Buphthalmeæ, divergent in its involucre; but whilst the two previously named Mediterranean genera assume in that respect the Mediterranean Cynaroid type, the southern *Ondetia* takes the scariose involucre of the southern Arctotideæ.

Geigeria, with eight South-African and two Arabico-Nubian species, is an anomalous genus, rather puzzling as to its affinities; the styles, the anthers, the colour of the flowers, and, to a certain degree, the habit are those of Buphthalmeæ, whilst the densely setose receptacle points to Cynaroideæ, and the deeply lobed corollas to that tribe or to Mutisiaceæ; but upon the whole its nearest affinity seems to remain with Buphthalmeæ. Geographical distribution does not here afford much assistance; but at least it is as much in favour of the Buphthalmoid affinity as of any other.

Gymnarrhena, a single Oriental species, is still more puzzling as to its affinities. It has the peculiar habit of the dwarf species of *Geigeria* and similarly deeply lobed yellow corollas; the receptacle, paleaceous under the female florets, but not under the sterile florets of the centre, is that of *Rhanterium*; but the female florets are in many rows, with short tubular corollas, as in the Conyzoid and many Grangeoid Asteroideæ, and as in the Plucheineæ amongst Inuloideæ. The tailless anthers would exclude it from all Inuloid subtribes and place it technically, as proposed by De Candolle, among Asteroideæ, where we might insert it after *Heterothalamus* in the *Baccharis* group. But it is in all other characters, as well as in a geographical point of view, so perfect a stranger there that it seems preferable to class it next to *Geigeria*, as an exceptional form, such as is *Barnadesia* amongst Mutisiaceæ. The style does not help us; for, the disk-florets being sterile, it is undivided, as is the case so generally in all tribes when similarly circumstanced.

Two South-African genera, *Osmites*, with six species, and *Osmitopsis*, with a single one, take their place among Buphthalmeæ in respect of almost all their general characters, as well as in habit (of *Odontospermum*) and the peculiar odour of the foliage; but the style is rather that of the South-African Athrixieæ than of the more northern typical Buphthalmeæ.

There remains a small anomalous plant from a very different region, which, after being attached to various tribes, must perhaps find its resting-place next to Buphthalmeæ. This is the *Nablonium* of Tasmania. Cassini placed it amongst Anthemideæ. In working up the Australian flora, I had trusted perhaps rather too much to Bauer's and Fitch's elaborate drawings and analysis, and referred it, after some hesitation, to Helianthoideæ. A more careful examination shows that we had all overlooked the long setiform appendages or tails to the anther-auricles. This places it technically among Buphthalmeæ, with which also, notwithstanding its reduced size, the foliage and indumentum agree better than with Helianthoideæ. Anthemideæ are quite out of the question.

5. *Helianthoideæ.*

The tribe Helianthoideæ is, again, one of the large ones. Not quite so numerous as Inuloideæ, it is still more varied. The species, rather under 1100, are distributed into about 140 genera not so easily classed into distinct subtribes as Inuloideæ, rather more scattered geographically, and many of the smaller genera remarkably distinct. As a whole the tribe is essentially American, and chiefly tropical or subtropical; but some genera have been early enough in the warmer regions of the Old World to have there established distinct species or sections, a very few small or monotypic ones from Africa or Madagascar or East India sufficiently differentiated to be maintained as genera (*Micractis*, *Epallage*, *Guizotia*, *Glossocardia*, *Microlecane*, *Glossogyne*). The development and usual persistence of the paleæ of the receptacle or bracts subtending the individual florets, the tailless anthers, and the pappus, when present, consisting of few rigid awns or paleæ, some of them more directly corresponding to the primary ribs of the achenes, are its principal characters. The style is very variable. The order is slightly connected through *Lagascea* with Vernoniaceæ, through Ambrosieæ with Anthemideæ, through Madieæ with Helenieæ, and through a few Verbesineæ with Inuloideæ (Buphthalmeæ); but the delimitation is rarely doubtful. Some of the structural characters, as well as the dispersion of several genera over the warmer regions of both the New and the Old World, seem to point this out as containing some of the most ancient forms of the order.

Among the numerous subdivisions which have been proposed, we have thought that ten might be maintained as subtribes, although very unequal in point of numbers and geographical range. As in the Inuloideæ, we will take them in detail in their systematic sequence.

1. *Lagascea*, a small genus of about seven species, is so distinct from all others as to require separation as a subtribe, and even the tribe it should be classed under is uncertain. Its style is that of Vernoniaceæ, where it has been technically associated with *Elephantopus* amongst genera with glomerate uniflorous capitula; but the habit, the mostly opposite leaves, the indumentum, and especially the corolla and pappus are so different from any thing observable in that tribe, that it has appeared to me to be better placed as a somewhat anomalous Helianthoid. Its geographical area is that of a large proportion of the American anomalous oligotypic genera, the Mexican region, to which all its species are limited except one, which, apparently as a weed of cultivation, has spread over many parts of South America, and has been also carried into the tropical regions of the Old World.

2. Under the name of MILLERIEÆ are collected a number of small or monotypic genera, some of which may not really prove to have

claims to consanguinity sufficient to be thus associated, and may possibly be, like *Lagascea*, isolated remnants of old, almost extinguished races or local divergent forms, whose connexions have not been properly appreciated. In the mean time they are somewhat technically associated by their mostly Helianthoid habit, foliage, and involucres, by their usually small capitula with a few female fertile florets; the disk-florets always sterile with undivided styles; the achenes of the fertile florets Helianthoid, rather large, often dorsally flattened or thick, subtended by or enclosed in the inner involucral bracts (or outer receptacular paleæ), without any or with a short coroniform or Helianthoid pappus; the abortive disk-achenes without any pappus, their florets crowded in the centre of the capitulum without intervening paleæ, or, at most, with a few reduced subtending setæ. Geographically they are somewhat scattered; the majority are American and tropical. *Heptanthus*, three species, *Pinillosia*, three species, and the monotypic *Lantanopsis*, are restricted to Cuba; *Tetranthus*, two species, is also insular, restricted to San Domingo; *Elvira* has three species, which some may regard as so many distinct monotypic genera, of which two are insular, limited to the Galapagos, the third dispersed from Central over many parts of tropical South America, as is also the monotypic *Milleria*; *Stachycephalum*, also monotypic, is limited to Mexico,—the above seven (or nine) genera having, perhaps, sufficient characters in common to be united into one genus of a higher grade; all have opposite or radical leaves and few-flowered small capitula. Technically allied to them, with small few-flowered capitula and radical or alternate leaves, and, perhaps, really of very distant affinities, is a genus of a much wider geographical distribution. *Adenocaulon*, with five species, belongs to the temperate or mountain W.-American region, two species being Chilian, one N.W.-American, and two, possibly varieties of the N.-American one, inhabitants respectively of Japan and the Himalaya. This genus had hitherto been classed with *Tussilago*, where, to my mind, it would be a more perfect stranger than amongst Millerieæ.

The three remaining genera, *Riencourtia*, five or six species, from eastern tropical South America, *Desmanthodium*, two Mexican species, and *Clibadium*, with fourteen species more generally dispersed over tropical and subtropical America, establish the connecting link between Millerieæ and Melampodineæ and the still more normal Helianthoid subtribe Verbesineæ.

3. MELAMPODINEÆ, nineteen or twenty genera and nearly 100 species, constitute a more definite subtribe, intermediate between Millerieæ and the great mass of Helianthoideæ (Verbesineæ), differing from the former in their completely paleaceous receptacle, from the latter in the constant sterility and undivided styles of the disk-florets. They are, with two exceptions, exclusively American and chiefly tropical, but occasionally extending further both northward and, in a less degree, southward. Most of them require here but a very short mention. *Ichthyothere*, eight species, *Baltimora*, two species, and *Acanthospermum*, two species, are strictly tropical and chiefly eastern; *Melampodium*, eighteen species, is also tropical, but with a much wider range, extending northwards over the Mexicano-Texan region, with one species (probably introduced) found also in various parts of the warmer regions of the Old World, and another, to all appearance really indigenous, in the Philippine Islands. *Espeletia*, eleven species, *Philoglossa*, one or two species, and *Schizoptera*, one species, are also South-American and tropical, but limited to the Andes; *Parthenium*, six species, and *Polymnia*, twelve species, are tropical, but also extratropical and chiefly, but not entirely, western, the former extending from Chili to the Mexican region, the latter from the Argentine Republic to Canada. Eight genera are limited to the Mexican region,—*Berlandiera*, with five species, *Guardiola*, with four, *Trigonospermum*, with two species, and the monotypic *Lindheimera*, *Engelmannia*, *Dicranocarpus*, *Aiolotheca*, and *Parthenice*. Another monotypic genus, *Lecocarpus*, is limited to the Galapagos Islands; *Silphium*, with eleven species, is exclusively North-American. This geographical arrangement is, however, not in conformity to structural affinities; the natural divisions of the subtribe have generally a wide range. The northern *Silphium*, the Andine *Schizoptera*, and the intermediate *Berlandiera*, *Lindheimera*, and *Engelmannia* might form one genus, which would then have as extended an area as *Polymnia*. The east tropical *Acanthospermum* and the Galapagian *Lecocarpus* might be included in the widely spread *Melampodium*.

There remains the genus *Chrysogonum*, which, although it is undoubtedly nearly related to *Silphium*, and has even one species belonging to the same area in North America, is yet more strongly represented in a widely distant region; two species are East-Indian and three are tropical-Australian. These Old-World species have been hitherto known under the name of *Moonia*; but, on attempting to draw up comparative characters in the subtribe, I could find nothing in habit or structure to distinguish the American from the East-Indian genera. The species are distinct enough; but one of those of the Old World is more nearly allied to the American one than to its co-citizens.

4. Ambrosieæ, ten genera and about forty species, form so distinct and natural a subtribe that it has been repeatedly proposed to raise them to the rank of an independent tribe, suborder, or even of a distinct order; and regarding the characters of *Xanthium* and *Ambrosia* alone, as they are usually expressed with a slight exaggeration, the separation would seem justified; I have, I believe, myself somewhere assented to it; but after a detailed examination of all the surrounding genera, I have felt compelled to admit that the majority of synantherologists are correct in placing them under the Helianthoideæ. They are, without doubt, connected with *Artemisia* as well as with Melampodineæ, having much of the habit of the former and passing into the latter through *Parthenice*; but geographically, as well as structurally, the relationship to Melampodineæ appears to me to be the closest. The Ambrosieæ are strictly American, although three or four species, as in the case of *Elephantopus*, *Eclipta*, &c., may be widely dispersed also over the Old World, whereas the *Artemisiæ* belong to an Old-World series, and are themselves of the Old World, although they may have some identical or representative species in the extratropical or mountain-regions of America. Delpino, however, in his above-mentioned memoir, as well as in his private letters, insists on the close connexion of *Artemisia* with Ambrosieæ, forming his subfamily of Artemisiaceæ, which he thinks he has established on irrefutable grounds. But to me it appears this is only a very natural attaching of undue importance to a class of characters the study of which he has specially carried out with so much success. He proposes two distinct "families," Senecionidæ and Helianthaceæ, the one with the style truncate at the end with a terminal tuft or marginal ring of hairs destined to scrape or *push* the pollen out of the anther-tube, the other with the hairs descending along the outside of the style so as to *sweep* out the pollen. This is an old distinction which experience has prevented from being made generally available. If Delpino had not confined himself to the examination of so small a proportion of the varied style-forms, if he had gone through any considerable number of our Senecionideæ and Helianthoideæ, he would soon have been stopped in his endeavours to class them according to his

views. To go no further than the few figured by Hildebrand in his above-mentioned memoir in the 'Nov. Act. Nat. Cur.,' what would he have done with the series *Doronicum*, t. 2. f. 23–26 (an undoubted truncate penicillate Senecionida), *Bidens*, t. 1. f. 30, 31, *Emilia*, t. 1. f. 11–13, *Dahlia*, t. 1. f. 26, 27, and *Gaillardia*, t. 3. f. 1, 2, which last is as undoubted a Helianthaceous style according to his views, and passes into the Asteroid *Solidago* style, t. 2. f. 7–9? Where would he, where could he draw the line? And if he had gone through many of the common tropical genera, he would have been obliged to remove *Gynura* far from *Senecio*, *Dahlia* from *Coreopsis*, *Spilanthes* from *Verbesina*, &c.

Delpino next divides Senecionidæ into two subfamilies, *Senecioneæ*, with zoidiophilous, and *Artemisiaceæ*, with anemophilous fertilization—according to him, a very remarkable and constant distinction, accompanied also by a difference in the position of the capitula, erect in one case, nodding in the other. As to the two modes of cross fertilization, or rather of the conveyance of pollen, it has hitherto been observed in so very small a number of species, that I must refrain from expressing any opinion as to their constancy as generic characters; but I would only refer to his own note, p. 34, as to the occurrence of the two modes in different species of one and the same genus. Erect and nodding capitula occur not unfrequently (e. g. *Lactuca* and *Prenanthes*) in different species of the same genus; they are not constantly nodding in *Artemisia*; and the Melampodineous genus *Parthenice*, too closely allied to *Parthenium* to be widely separated from it, has the habit and nodding capitula of the Ambrosieous genus *Cyclachæna*.

Ambrosieæ are remarkable for their anthers less perfectly connate than in any other Compositæ, although closely approximate, forming the usual cylinder and often slightly cohering; they are also distinguished by their terminal appendages inflected or hooked at the end, as observed by A. Gray*. The anther-bearing florets are as constantly sterile as in Melampodineæ and Millerieæ, and the styles of these sterile florets as constantly undivided, but with the different termination pointed out by various synantherologists and insisted on by Delpino. The genera may be distributed into two groups. In the first, the Iveæ, the capitula are heterogamous, as in Melampodineæ, with female florets in the circumference and sterile antheriferous ones in the disk. In *Iva* itself, with seven or eight Northern or Central American species, the corollas of the female florets are much reduced; in the two species of *Cyclachæna* and in the monotypic genera *Euphrosyne, Dicoria,* and *Oxytænia,* all Mexican or Californian, the female corollas entirely disappear, the style proceeding from the summit of the naked ovary, or at most surrounded by a rudimentary ring. In the second group the capitula are strictly monœcious, the males usually placed in a different part of the plant from the females. The female florets are again apetalous; but each one is completely enclosed in an involucral bract consolidated with more or less of the outer ones in a close utricle, from the beaked apex of which issues the style. These female capitula are sometimes one-flowered and distinct; sometimes there are two to four female flowers, each in a separate beaked and closed division of a common mass. Whether this mass is an aggregate of two to four consolidated one-flowered capitula or a single capitulum with the inner involucral bracts closed round the achenes, as in *Sclerocarpus* or *Melampodium,* and connate with each other as well as with the outer bracts, is a disputed point, the advocates of each side of the question being certain that they are right. To me it appears that the inflorescence may be explained either way, the florets not being numerous enough to supply any such proof as we have in the case of *Albertinia.* The four genera of this second group are all American, or, at least, as it would appear, of American and probably western origin. *Hymenoclea,* two species, is Mexican or Californian; *Franseria,* ten species, ranges from Chili to California, extending also eastward in North America; *Ambrosia,* twelve species, belongs to the same regions, but one or two of its species are also spread over a great part of the Old World, as in the above-mentioned cases of *Elephantopus* &c. *Xanthium* has two or three species, but too well known over almost all warm or temperate regions of the globe. The genus is probably of American origin, although the common species *X. strumarium* had evidently made its way into the Old World long before the discovery of America, and has established both in Asia and Europe many so-called species, none of which, however, appears to have acquired much of a local character, and some are repeated in America. *X. macrocarpum*, DC., first described as a Mediterranean plant, is believed to be a more modern introduction from America; *X. spinosum*, Linn., which has quite recently extended its range over new countries (*e. g.* Australia), was originally said to be Chilian.

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* In a recent part of the 'Proceedings of the Academy of Natural Sciences of Philadelphia,' 1869, p. 189, Mr. T. Meehan observes that in *Ambrosia artemisiæfolia* this inflexed setiform appendage is only to be found on anthers which do not present perfect pollen; the abundantly polliniferous anthers are broad, without horns.

5. PETROBIEÆ form a small subtribe of three genera comprising 4 species, very distinct, by their strictly diœcious capitula, and remarkable for the flowers of the two sexes being more nearly similar than in most heterogamous Compositæ. The corollas of both sexes are regular, though still different in proportions; the stamens in the females are more developed than usual, having well-formed anthers, although small, free, and without pollen; the styles of the males are undivided in one genus, branched in the two others. They are trees or shrubs, with the other characters of Helianthoideæ. Geographically they are all of limited range. *Podanthus*, with two species (or varieties?), is Chilian; *Astemma*, a single species as yet only known from Humboldt's original specimen with female capitula, is from the Andes of Quito; the third, *Petrobium*, also monotypic, is insular, being limited to the island of St. Helena. Several of the above circumstances suggest the probability of these genera exhibiting the nearest approach to the primitive form of Compositæ.

6. ZINNIEÆ are a group of five or six genera, comprising twenty-five species, only separated from the great mass of Verbesineæ by the ligulate corollas of the female florets sessile or nearly so, and persistent on the ripe achene, without any external pappus or border at the base, and so deceptively continuous with the achene as in some instances to have given rise to a query whether this corolla did not really stand in the place of the pappus and represent the calyx-limb—a query, however, to which a careful examination will at once give a negative answer. These genera are all West-American and chiefly of the Mexican region; *Tragoceros* four species, *Zinnia* twelve species, *Sanvitalia* three or four species, and *Aganippea* two species limited to that region; *Heliopsis* has three species, of which one extends southwards along the Andes and the two others eastwards in North America. One or two species of *Zinnia*, long in cultivation for ornament, have established themselves as colonists in some parts of the Old World. *Philactis*, a single species, also Mexican, is unknown to me, but probably belongs to the *Zinnia* group.

7. The main subtribe of VERBESINEÆ comprises about 570 species distributed amongst 57 genera, many of them natural enough, but distinguished by characters of comparatively small importance, sometimes passing into each other, and often very technical and very difficult to group together except into very artificial series. The great majority are American, many of them restricted to that continent or to limited areas within it; but some are well represented in tropical Africa, or in a less degree in Asia or Australia, and two small genera are exclusively Mascarene. The geographical distribution of the two following subtribes (8. COREOPSIDEÆ, 17 genera with 150 species; and 9. GALINSOGEÆ, 7 genera with 80 species) is nearly the same, the one comprising also 4 small exclusively Old-World tropical genera, and the latter 1 small Sandwich-Island endemic genus. As the differences which distinguish them from Verbesineæ are also of somewhat minor importance (chiefly the shape of the achene in the one case, the nature of the pappus in the other), and as the real value of the generic distinctions is often as yet uncertain in all three subtribes, we may consider the whole as one group, taking the principal genera rather in the order of their geographical distribution, commencing with those American ones which are also represented in the Old World by distinct species.

Wedelia, about forty species, *Blainvillea*, ten species, slightly differing in the pappus, and *Aspilia*, thirty species, with neutral ray-florets, may be regarded as one large genus, chiefly American, of which each of these divisions includes several Old-World species, the whole group also scarcely distinct from several other purely American genera. *Wedelia* itself, as now limited, comprises three tolerably well-marked sections: (1) *Stemmodon* has three or four tropical-American species and one in tropical Asia, *W. calendulacea*, a maritime plant very closely allied to the similarly maritime West-Indian *W. gracilis*, although not identical; (2) *Cyathophora*, with numerous tropical American, has one insular (Galapagos) species, *W. frutescens*, Hook. f., which appears quite distinct from Jacquin's plant of that name, one East-Indian species, *W. urticifolia*, and one in east tropical Africa; (3) *Wollastonia*, with the pappus very much reduced or disappearing altogether, appears to be an Old-World deviation, and is limited to tropical and subtropical Asia and Australia. Although usually regarded as a genus, there is really nothing but this reduced pappus to separate it from *Cyathophora*; one species, indeed, so closely resembles the above-mentioned Asiatic *W.* (*Cyathophora*) *urticifolia*, as to be frequently mixed with it in collections. *Blainvillea* is represented in tropical Africa and Asia by three or four species, one of them proposed as a distinct genus, but which are all closely allied to a common east tropical American weed, the typical *B. rhomboidea*, Cass.; they seem, however, to be rather representative than identical species. Two other common American weeds (both nearly allied to, but sectionally or, according to some, generically diverging from *B. rhomboidea*), *Blainvillea biaristata*, DC., and *Eleutheranthera ruderalis*, Sch. Bip., are not represented in Africa. *Aspilia* was the generic name originally given to a Madagascar plant, which, on a comparative examination, has appeared to me to be strictly congener as well with the African *Coronocarpi* as with a number of American, chiefly Brazilian, plants, referred by different botanists to various genera, including the whole of the genus *Anomostephium*, DC. Amidst these several names, Dupetit Thouars's *Aspilia* has the right of priority. The genus thus formed is divisible into three not very well-defined series, of which two are exclusively Brazilian; the third, extending in America from Brazil to Mexico, also includes some of the African species, though no one species is identical in the two continents; the Mascarene and one or two African ones cannot be exactly included in either of the American series. The tropical American genera *Zexmenia*, twenty species, and *Oyedæa*, twenty-two species, neither of them represented in Africa, are very closely allied to *Wedelia*, as is also the insular *Lipochæta*, consisting of ten Sandwich-Island and one Galapagos species (*Macræa*, Hook. f., united with *Lipochæta* by A. Gray).

Sclerocarpus was originally established for a tropical African plant now known to extend into tropical Asia, remarkable for the receptacular paleæ completely enclosing the disk-achenes and hardened round them, so as to appear to form part of them. Precisely the same structure was observed in some tropical American species, never compared with the African one, but distributed into various genera, although one of them (*Gymnopsis uniserialis*, Hook.), if not exactly identical with *S. africanus*, is so closely allied to it as to be strictly representative. The genus thus consolidated comprises one tropical African and nine American species, chiefly from the Mexican region, but extending also into tropical South America. A similar structure is observable in the American genus *Montanoa*, of about fourteen species, ranging from Columbia to the Mexican region.

Melanthera is a small natural group of about eight species, distinct in the form of its achenes as well as in habit and minor characters, and common to tropical America and Africa. It has been divided into four purely artificial genera:—*Melanthera* proper, four American species without any female florets; *Lipotriche*, one African species with fertile ray-florets; *Echinocephalum*, one American, and *Wurmschnittia*, one Abyssinian species with neutral ray-florets.

Spilanthes is another natural genus, readily distinguished from its nearest allies by the truncate style-branches and other characters, and widely distributed over the tropical world. It is difficult without a detailed study to fix either the number of species, ranging between twenty and forty, or rightly to appreciate the geographical distribution of some of them. The greater number appear to be American; and one or two of these, as in *Elephantopus*, range over the Old World; but a few also appear to be really of Old-World origin, especially two extending from the Indian archipelago into Australia.

Coreopsis, in the extended sense in which we have taken it, neglecting, as in *Melanthera*, the differences between the neutral and the fertile ray-florets, contains nearly sixty species, and, although chiefly American, has established distinct forms in tropical Africa and in the Sandwich Islands. In America the range of the genus is wide, but chiefly northern, western, or Andine, and consequently not quite of so tropical a character as that of most American genera represented in tropical Africa. Several local American species or groups of species have been separated at various times as distinct genera characterized by the fertility or by the reduction of the pappus of the ray-florets, or by slight modifications in the margins of the achenes, &c. The African species were by some singular misconception of characters referred originally to *Verbesina*; they have since been established by Schultz Bipontinus as a distinct genus under the name of *Prestinaria*; but they correspond too closely to the Peruvian (shrubby) or Californian (herbaceous) *Agaristæ* to be generically separated from them. The Sandwich-Island *Campylothecæ*, united by A. Gray with *Coreopsis* and by Schultz Bipontinus with *Bidens*, must be regarded as an insular group almost as near to the one as to the other, although technically referrable to *Coreopsis*. The species are so varied, however, in habit and in some minor points of structure, that they could scarcely be kept together had not their geographical isolation indicated a relationship which would not otherwise have been so clear.

Bidens, a genus of about fifty species (nearly doubled by some botanists), although technically distinguished from *Coreopsis* by a somewhat trivial character, the asperities of the awns of the achenes directed downwards instead of upwards, is nevertheless a natural genus; and although geographically it may have as wide a range as *Coreopsis*, its distribution has a different character. The genus has two natural sections; one (*Platycarpæa*) is so generally diffused over the temperate regions of the northern hemisphere that it would be difficult to determine whether its origin is American or Europæo-Asiatic; and the representative species in the two regions differ but little from each other. There are, however, two or three American species unrepresented in the Old World; and Cassini's St.-Domingo genus *Narvalina* (a single species) may be considered as a divergence only from the *Platycarpææ*, thus confirming some other evidences of the American ancestry of the group. One of our common species, *B. tripartita*, Linn., represented in America by *B. frondosa*, Linn., and *B. connata*, Muehl., reappears in the southern mountain-ranges of Australia. The other section, *Psilocarpæa*, is more tropical and essentially American. Two species are indeed amongst the commonest weeds all over the warmer regions of the Old World; but that is a case similar to that of the *Elephantopus*, if, indeed, the presence of these species in some districts be not due to modern importations, wonderfully facilitated by the prehensile nature of the awns of the achenes.

A Sandwich-Island *Bidens*, in its reduced pappus, shows an anomalous insular form, and may possibly be derived rather from the *Coreopsides* (*Campylothecas*) of the same islands. At any rate, this group shows the connexion of *Coreopsis* with *Bidens*, and is an example of divergence, with different combinations of characters in the isolated islands, from those which have become established in the general continental area of the genera.

Various groups, further diverging from *Coreopsis* and *Bidens*, have arisen in various portions of the extended area of the genera:—in west tropical America, extending more or less from Bolivia to the Mexican region, *Dahlia* with four or five species and *Cosmos* with ten; in east tropical America *Isostigma*, five species; in subtropical America, north and south (Mexican and Bonarian regions), *Thelesperma*, four or five species; and in east tropical Asia and Australia, *Glossogyne*, five species.

Amongst the epappose Verbesineæ there are two small and very distinct genera which have a very wide tropical distribution. *Enhydra,* with about a dozen species, is well represented in tropical Asia, Africa, and America, and has no near connexions in either country to indicate its origin, unless perhaps the Andine genus *Aphanactis,* two species, prove to be really allied to it. The most distinct species of *Enhydra* are also American; those of the Old World may be varieties of a single one. The other genus, *Eclipta* (three or four species), has likewise one cosmopolitan tropical species, to which the nearest allied local one is Australian; but beyond that there are no further connexions in the Old World. The remaining one or two species, forming a slightly distinct section, are in extratropical South America, where also is to be found the next nearest monotypic genus, *Leptocarpha.*

Chrysanthellum is a small annual weed dispersed, under various names, over tropical Asia, Africa, and America, without affording any clue as to its original country, except the faint one supplied by a second species which has established itself in the Galapagos, tending to indicate an American origin. Affinities with other genera give no further assistance; for the nearest to it (though quite distinct from it) appear to be *Heterospermum* and *Glossocardia,* both monotypic, the one tropical-American, the other East-Indian. *Synedrella,* which is a nearer approach to the true Verbesineæ, has two American species, of which one, like *Elephantopus,* is dispersed over tropical Africa and Asia.

With regard to the Verbesineæ strictly limited to America, the North-American genera take a great part, although not displaying any proportionate diversity of form except in the Mexican region. *Rudbeckia,* which, taken as a whole, is a natural and distinct genus of twenty-five species, is limited to North America and almost to the United-States region; so also are *Balsamorhiza* (ten species), *Wyethia* (four species), *Helianthella* (six species), all more or less diverging from *Helianthus,* but geographically rather more western. *Tetragonotheca* (three species) is likewise strictly North-American, but more distinct. *Helianthus* itself is by far the largest North-American Helianthoid genus; for about forty out of its fifty-two species are spread over that continent without having any special western character. It is, however, represented in Central and Southern America not only by a few species, which cannot well be generically distinguished from it, descending along the Andes of Peru as far as Chili, but far more numerously by the Central-American genus *Tithonia*, three or four species, and the general tropical-American *Viguiera*, of about sixty species, both of which are, on the one hand, somewhat artificially distinguished from *Helianthus*, and, on the other hand, pass almost into the already-mentioned tropical *Wedelia* group, or into a few of the smaller Mexican or tropical genera which I shall presently refer to.

Confined to the Mexican region we have nine or ten genera of one or two species each:—*Rumfordia*, *Selloa*, *Axiniphyllum* (*Abasaloa?*), *Varilla*, *Chromolepis*, *Mirasolia*, *Iostephane*, *Otopappus*, and *Podachænium*, to which we may add the Coreopsideous genus *Coreocarpus*, also of two species only. Small as they are, I do not think that any of these genera are sufficiently connected with any of their large cotribuals to be incorporated with them, unless these again be much more consolidated; nor do they form of themselves a separate group in the subtribe. Like so many others of the same region, they may be considered as the scattered remnants of various ancient races. The distinct genus *Encelia*, which, taken in its natural extended limits, comprises twenty-two species, is also Mexican, but extends southwards and northwards from Chili to California.

In the insular genus *Scalesia*, eighteen or ten Galapagian species, may be traced a connexion with the above mentioned *Mirasolia*, which belongs to the southern or Central-American portion of the Mexican region.

In the South-American Andes we have again four genera of one or two species each:—*Monactis*, *Stemmatella*, *Aphanactis*, and *Garcilassa*, as much if not more isolated than those of the Mexican region, none of them having any nearer connexions than the general affinity to the whole subtribe. *Pascalia*, a monotypic genus of the same region but more southern, and quite or nearly extratropical, is generally allied to the *Wedelia* group.

Among tropical-American Verbesineæ, besides those already mentioned as connected with the North, the most important is *Verbesina* itself, with about fifty species, dispersed over the whole region, and represented by several species in North America, and one or two extending beyond the tropics to the south. One species, distinguished by most authors on very trifling characters under the name of *Ximenesia*, is met with in tropical Africa and some other warm countries, but evidently introduced from America, where alone true *Verbesinæ* and their immediate connexions are indigenous. The nearest slightly diverging genera are *Actinomeris*, nine species, ranging from the Mexican region eastward in N. America, only distinguished from *Verbesina* by the sterility of the ray-florets, and *Salmea*, twelve W.-Indian and Mexican species. The Brazilian monotypic *Salmiopsis* appears to be a connecting link between *Salmea* and some Brazilian *Viguieræ*; and the above-mentioned Mexican *Otopappus* may also be considered as a divergent form of *Salmea*.

The tropical *Wullfia*, eight species, and the tropical and Mexican *Perymenium*, ten species, have their nearest connexions probably with *Wedelia* and with *Melanthera*.

Gymnolomia, eighteen species, *Zaluzania*, seven species, and *Sabazia*, eight species, might perhaps be considered as a single genus ranging over the Mexican region, Central America, the W. Indies, and Columbia, but not, as far as I am aware, extending into E. tropical S. America. The above-mentioned Mexican *Varilla* might perhaps be included with them. *Jægeria*, six tropical-American species, ranging from Bonaria to Mexico, in some respects approaches the same group, being evidently very near *Sabazia*, but really perhaps more nearly connected with *Stemmatella* and *Siegesbeckia*, the chief geographical centre of all three being apparently the Andine region.

The West-Indian *Borrichia*, three species, and *Chænocephalus*, one species, and the tropical-American *Trichospira*, also monotypic, stand each of them isolated as it were in the great subtribe of Verbesineæ.

There are two genera of the subtribe Coreopsidæ, bordering upon Verbesineæ, that are limited to tropical Africa (and, indeed, both of them have been hitherto observed as indigenous in Abyssinia only)—*Guizotia*, with three species (one of them spread by cultivation over East India), and *Microlecane*, one species. The nearest connexion of both may be with some of the African forms of *Coreopsis*; but it is not very close.

Two Mascarene genera, *Micractis*, one species, and *Epallage*, two species, evidently belong to Verbesineæ; but I am unable at present to trace out the genera they are most nearly connected with.

The foregoing genera belong to the subtribes Verbesineæ and Coreopsidæ; the third subtribe *Galinsogeæ*, which I have grouped with them, is entirely American. The genera of which it is composed have been usually classed under Helenioideæ, on account of their scaly pappus; but their affinity appears to me to be much greater with Verbesineæ, of which they have the habit, the paleaceous receptacle, &c., so much so that some species of *Calea* where the pappus is occasionally or constantly deficient, are difficult to distinguish from *Sabazia* and its allied Verbesineous genera. Of the seven genera composing the subtribe, all well defined, if taken in their extended sense, three (*Balduina*, two species, *Marshallia*, three species, and the monotypic *Blepharispermum*) are exclusively N. American, three (*Galinsoga*, three species, *Calea*, about sixty species, and *Tridax*, six species) are widely dispersed over the tropical and even subtropical regions of America, one species of *Galinsoga* and one of *Tridax* having become extensively spread as introduced weeds, the former in the temperate and tropical regions of the Old World, the latter within the tropics only. The seventh genus, *Dubautia*, four species, is insular, limited to the Sandwich Islands.

10. The subtribe MADIEÆ forms a very natural group, connected, it is true, with the Helenioideæ as well as with the Helianthoideæ, but most nearly so with the latter, and with a very limited geographical range. Five genera (*Madia* eight species, *Hemizonia* about twenty-five, *Lagophylla* three, *Layia* about twelve, and *Achyrachæna* one species) belong to western N. America from Mexico to British Columbia, one of the species reappearing in Chili. These might all be easily regarded as a single genus. The two other genera of the subtribe, differing more perhaps in habit and the large size of the capitula than in any important structural characters (*Wilkesia*, one species, and *Argyroxiphium*, two species), are insular, limited to the Sandwich Islands.

6. *Helenioideæ.*

The essentially American Helenioideæ connect the American Helianthoideæ with the Old-World Anthemideæ on the one hand, and with the cosmopolitan Senecionideæ on the other. The tribe is generally considered as forming three subtribes, or divisions of Senecionideæ or Helianthoideæ; but it appears to me that the circumscription of these large groups is more natural if they are kept distinct. The Helenioideæ are not numerous in species, but varied in form; the species (not quite half as many as those of Anthemideæ, under one third of those of Helianthoideæ) average five to a genus, whilst in Helianthoideæ the average is about eight, in Anthemideæ above sixteen. It differs from Helianthoideæ in the absence of any paleæ to the receptacle, and most frequently in the involucre approaching more to that of Senecionideæ or of Anthemideæ, in the pappus either of distinct equal scales or reduced as in Anthemideæ, or passing almost into the setæ of Senecionideæ, in the shape of the achenes and in the greater fertility of the florets. Sterile disk-florets with undivided styles, characteristic of three considerable subtribes of Helianthoideæ, are only known in the somewhat anomalous genus *Blennosperma* among Helenioideæ; and sterile ray-florets, not unfrequent in the former, have only been observed in *Gaillardia* among the latter. The geographical distribution is nearly that of Helianthoideæ, but more strictly American, and chiefly western or extratropical; only three species out of near 300 are known in the Old World, of which two are S.-African, and one, identical with a S.-American one, is Australian.

The tribe consists of four very natural subtribes, *Bærieæ*, *Flaverieæ*, *Tagetineæ*, and *Euhelenieæ*, besides four more distinct genera technically united as a fifth subtribe under the name of *Jaumieæ*.

The subtribe *Bærieæ*, about 110 species in 30 genera, is the most characteristic of the tribe (although for the latter the name of Helenioideæ has been adopted as having the right of priority) in structure as well as in geographical range. The *Bærieæ* are indeed throughout so eminently W.-American, that very little special mention need here be made of separate genera: 26 out of the 29 are found in the Mexican region (if we include California); three of these (*Chænactis*, *Hymenopappus*, and *Palafoxia*) extend rather more eastward in N. America; one only (*Schkuhria*) extends into E. tropical S. America; four (*Lasthenia*, *Bahia*, *Villanova*, and *Blennosperma*) are represented in Chili by identical or nearly allied species. Of the three genera not yet observed in the Mexican region, one (*Thymopsis*) is not far removed from it, being an insular form limited to Cuba, the two others (*Closia* and *Amblyopappus*) are Chilian, and may yet appear in the northern hemisphere.

The genus *Flaveria*, seven species, with the closely allied monotypic *Sartwellia*, belongs to the same W.-American region as the Bærieæ, extending from Chili to Mexico and Florida; one species, either identical with or closely representative of the commonest of the American ones, is also found in Australia. If only a colonist there, it must be so ancient a one as to have undergone some slight modifications in form. As a subtribe these Flaverieæ are rather further removed from Helianthoideæ, and approach the Tagetineæ; their involucre is the most prevalent one in Senecionideæ, the style that of Anthemideæ and the larger portion of Senecionideæ, the achenes such as are prevalent in Bærieæ and Tagetineæ.

The S.-African monotypic genus *Cadiscus* is anomalous, but appears to me to be much more nearly connected with the Helenioid Flaverieæ than with any S.-African type.

The *Tagetineæ*, 13 or 14 genera and above 100 species, form as a whole a very natural group, which will, moreover, very naturally divide into three, *Porophyllum*, *Tagetes*, and *Pectis*, taken each in the most extended sense. All three have their principal seat in the Mexican region, but extend in a few species all over the warmer parts of South America; very few species reach California, none extend far eastward in N. America. A monotypic form diverging from *Porophyllum* (*Lescaillea*) is insular, limited to Cuba; another monotypic, *Schizotrichia*, is Peruvian. None are known from the Old-World except as introduced weeds, one or two species of *Tagetes* itself, long cultivated for ornament, having almost naturalized themselves in some parts of tropical Asia and Africa.

As a whole the subtribe connects Helianthoideæ with Senecionideæ, *Porophyllum* and some species of *Pectis* having almost the pappus of the latter tribe. The whole, or nearly the whole, are remarkable for the large oily receptacles or glands scattered on their foliage and involucres. *Pectis* (40 species) has the style-branches much shorter than in any other genus of Helenioideæ, or of any of the nearly connected tribes, and is, moreover, marked by the rigid cilia at the base of the leaves or petioles. *Syncephalanthus*, a monotypic form included among those which diverge from *Tagetes*, has a very curious inflorescence; the capitula are collected in clusters which assume precisely the aspect of the single radiate capitula of *Bæbera*, the central capitulum of the cluster having no ray, and the ray-florets of the surrounding ones being only on the outer side, so as to form one continuous ray for the whole cluster. This peculiarity occurs also in the S.-African genus *Œdera*, and appears to have no special significance, systematical or geographical. The genus *Clappia*, two species, so closely connects Tagetineæ with Senecionideæ, that it is difficult to determine to which it should be referred. The aspect and most of the characters, as well as geographical considerations, tend towards Tagetineæ; but there appear to be no oleaginous glands. Both the species require further investigation from more perfect specimens.

Euhelenieæ, seven genera and about forty-five species, all American, are chiefly extratropical; they form in some instances a near approach to Anthemideæ, and may be generally considered as the American representatives of that Old-World tribe, although in a very few species they also show an approach to Senecionideæ. Structurally they differ from the preceding subtribes, chiefly by their shorter silky-villous achenes, and by their broader, more open, and sometimes Anthemoid involucres. The principal genera are not in N. America so specially Mexican as most Helenioideæ, but spread more equally to the eastward. They generally, if taken with their most natural limits, include in one genus species with fertile or sterile ray-florets, or without any at all. Under this view *Helenium*, with about sixteen N.-American species, may be said to be represented in extratropical S. America by *Cephalophora*, four or five species; *Gaillardia*, with five N.-American species, has a sixth extratropical southern one (*Güntheria*). *Actinella* with ten species is confined to N. America; but *Hymenoxys*, four species, which is nearly related to it, but with a more Anthemoid aspect, is both in extratropical S. America and in the Mexican region.

Psathyrotes, a Mexican genus of three species, has much of the involucre and pappus of a Senecionidea; but the achenes and some other characters are those of the Euhelenieæ, and the closely allied monotypic *Trichoptilium*, from California, connects it with the latter in the pappus also.

There remain four genera, which, on account of their involucral bracts, imbricate in several rows, increasing from the outer to the inner, are anomalous in Helenioideæ, and are artificially placed in a separate subtribe, Jaumieæ. Two of them, *Cacosmia* four or five species, and *Geissopappus* two species, are from tropical America, and correspond in many respects to the Helianthoid genera *Calea* and *Galinsoga* from the same region, but have the naked receptaculum and the achenes of Helenioideæ. *Jaumea* is a small genus which appears to me as distinct in habit and character as it is remarkable for its scattered geographical distribution. Its five species have been published as so many separate genera, but never appear to have been compared with each other. The original typical species is a creeping maritime plant from Buenos Ayres with rayless capitula; *Coinogyne*, a maritime Californian plant, is scarcely to be distinguished from it except by its radiate capitula; *Espejoa* is a Mexican species, with an erect branching stem and radiate capitula; *Chæthymenia* is another erect branching Mexican species with radiate capitula, but with much less obtuse involucral bracts. *Hypericophyllum*, from S. tropical Africa, closely resembles *Chæthymenia*; but the capitula are rayless as in the typical *Jaumea*, and the leaves, though entire glabrous and rather thick as in the other four, are broader. If all these had been found in the same district, no one would have doubted their being congeners; and had any of them, in its own special locality, diverged into allied forms different from those of the distant species, we might have admitted them, as distinct genera upon very slight characters; but as none have any near connexions in their own district, we must conclude that they are all really congeners with the scattered distribution, hitherto unaccounted for, of *Melasma*, *Alectra*, and others.

Venegazia, a monotypic Californian genus thus associated with Jaumieæ, appears in some respects to approach Anthemideæ in structure; but the involucre, the achenes, and the pappus, as well as the geographical position, are those of Helenioideæ. *Olivæa* is another monotypic genus of the Mexican region, but rather more nearly connected with normal Helenioideæ.

7. *Anthemideæ.*

Anthemideæ, with very few exceptions, are essentially of the Old World, chiefly extratropical, and far less varied than the two preceding tribes. About 650 species are contained in forty genera; and several of these seem to pass into each other. It is not easy, either, to group them into well-marked subtribes; and, as in the case of Asteroideæ, it will be necessary to consider a few of the principal genera as centres of groups round which others are more or less divergent. As a whole, Anthemideæ are remarkably constant in their tailless anthers and truncate style-branches; and their pappus, either very shortly paleaceous or coroniform or entirely wanting, has but very few exceptions. Their habit and involucre often connect them with Asteroideæ on the one hand and Arctotideæ on the other; but their style readily distinguishes them from both. Between Anthemideæ and Helenioideæ (Euhelenieæ) there is, perhaps, no very definite boundary; but generally the habit, involucre, or geographical distribution, accompanied by various minor indications, do not leave much doubt as to the position of a genus.

In the 'Genera Plantarum' we have, for convenience' sake, classed the genera somewhat artificially. In considering their geographical distribution we must adopt a different sequence, taking:—first the great northern genera *Anthemis* and its allies, *Chrysanthemum*, *Tanacetum*, and *Artemisia*, some of which extend a few species into North America; then the South-African *Athanasia*, *Hippia*, and their allies, all restricted to that region; thirdly, the Cotuleæ, which are more cosmopolitan, belonging in a great measure to the southern hemisphere; and, lastly, a few isolated local genera.

Anthemis, above eighty species, *Anacyclus*, about ten species, *Achillea*, near 100 species, *Santolina*, about eight species, and the monotypic *Cladanthus*, *Diotis*, and, perhaps, *Lonas* and *Mecomiscus*, separated from each other by characters of no great importance, besides habit, are distinguished from *Chrysanthemum* by their paleaceous receptacle. The two larger genera, *Anthemis* and *Achillea*, range over Europe, North Africa, and extratropical Asia, their chief centre being the Mediterranean region and the Levant. One species, the common *Achillea millefolium*, appears to be spread over the whole of Europe, northern and central Asia, and a great part of North America, where are also mountain species of the same genus. But no *Anthemis* is to be met with in America or in the southern hemisphere except as weeds of cultivation. *Santolina* and *Anacyclus* are limited to the Mediterranean region taken in a rather wide sense. *Cladanthus* is a West-Mediterranean plant; *Diotis* a maritime species extending along the greater part of the European and African coasts, around the Mediterranean, and along the Ocean from the Cape to the British Islands. *Mecomiscus* is an Algerian plant, exceptional in the tribe on account of its leaves opposite and entire as in the southern *Eumorphia* and *Œdera*.

Chrysanthemum, taken in the extended sense we have given it in the 'Genera Plantarum,' includes above eighty good species, and has nearly the same range as the *Anthemis* group. It has, however, fewer mountain species than *Achillea*, and extends only into the extreme north of America; southward it reaches much further than

Anthemis or *Achillea*. Several species, usually of a somewhat shrubby growth, are natives of the Canary Islands, and two or three, also shrubby and somewhat anomalous, are South-African. But the circumscription of the genus is somewhat uncertain: some botanists divide it into about twenty genera, which may readily be distributed into five series; others, again, remove the greater part of the perennial species into *Tanacetum*. This, however, does not much affect the group geographically considered. Excepting the Canary-Island *Argyranthema*, the two or three larger series into which the genus might be divided have nearly the same range as the whole genus; and the numerous monotypic genera proposed belong chiefly to its great centre, the Mediterranean region. *Richteria* alone belongs to the mountain-region of Central Asia, where are also found two small genera, *Allardia*, four or five species, and the monotypic *Cancrinia*, which might almost have been included in *Chrysanthemum*, but for their pappus, which in both is exceptional in the tribe, showing an approach in the one case to that of Senecionideæ, in the other to Helenioideæ. One of the few South-African *Chrysanthema* is, perhaps, a still further deviation from the ordinary type than the Canary-Island *Argyranthema*; but it has not been generically distinguished by the botanists who have worked out the Cape flora, and is not, perhaps, sufficiently known properly to appreciate its affinities.

Matricaria, with about twenty species, has the wide range of *Chrysanthemum*, with, however, a southern preponderance—the perennial species with restricted areas belonging chiefly to South Africa, the northern species, chiefly annuals, having a very general distribution (partly as weeds of cultivation), two of them occurring in North, especially North-west America; two or three only of the more restricted species belong to the Mediterranean region. The twenty species have long been in a very unsettled state as to their systematic arrangement. Distributed into half a dozen small genera, or united in two only, severally associated some with *Chrysanthemum*, others with *Tanacetum* or *Cotula*, they are now generally recognized as forming one generic group, connecting, as it were, *Chrysanthemum* with the Cotuleæ, differing from the former chiefly in the ribs of the achenes not equidistant round the achene, but more or less approximate towards the inner face, leaving a broader dorsal interval, and generally by their conical or elongated receptacle and the involucre approaching that of the Cotuleæ. In one species there is also a tendency to the reduction of the female corollas. This approach to Cotuleæ is thus traceable both in geographical distribution and in structure.

Tanacetum, about thirty species as we now propose to limit it, belongs exclusively to the northern hemisphere; for the South-African species retained by Harvey in the genus appear to be much better placed in *Schistostephium*. It has been found difficult to draw up definite structural characters constantly to distinguish *Tanacetum* from *Chrysanthemum*; for the most important difference, the female florets, short and tubular or filiform in *Tanacetum*, ligulate in *Chrysanthemum*, is unavailable in the few species or varieties where the female florets are deficient; and therefore Schultz Bipontinus and some others have brought a large number of the common *Chrysanthema* into *Tanacetum*. But this appears to me to be a very unnatural combination; and in the few cases which might otherwise have been doubtful, habit comes in aid of the distinction. *Tanacetum* also, on the other hand, runs as much into *Artemisia*; and in order to maintain some order in the tribe we must here, as in Asteroideæ, admit as genera large and prominent groups, although they may be confluent on their borders.

Tanacetum has a more Eastern range than *Chrysanthemum*; there are but few in Europe or in the West-Mediterranean region, more numerous in the Levant and Central Asia; some species extend into the far north, and thence into North America, where, in the mountains of the western regions, are two endemic species with some slight structural peculiarities which induced Nuttall to propose them as a distinct genus, *Sphæromeria*.

Artemisia, to which some botanists ascribe near 200 species, with the same general centre as *Tanacetum*, Asiatic rather more than European, has a wider range. Abundant in the temperate regions of the northern hemisphere throughout the Old World, it has also many Alpine and Arctic species, and spreads not only over the greater part of North America, but also down the western ranges of mountains to extratropical South America. Geographically *Artemisia* thus meets there with the genus *Ambrosia*, possessing a somewhat similar foliage, nodding capitula, a style in some respects similar, and, according to Delpino, a similar anemophilous fertilization, to which characters I have already alluded under Ambrosieæ; but here the affinity ceases. There is nothing in *Artemisia* of that perfect separation of the sexes, of that freedom or very slight connexion of the anthers, of their peculiar inflected appendages, of the enclosure of the achenes in their subtending bracts, or of the many other features characteristic of the Ambrosieæ; and in the style it is only in a very few species of *Artemisia* that there is any approach to the consolidation of its branches in the sterile flowers, which is constant in Ambrosieæ, and which, moreover, is of common occurrence in the sterile flowers of many other Compositæ belonging to very different groups: geographically, also, it is only as the outskirts of the wide range of some generally diffused species that the Mexican region, the great centre of preservation of the Ambrosieæ, possesses one or two *Artemisicæ*; this genus has not there produced a single endemic form. *Artemisia* is, on the other hand, very closely connected with *Tanacetum*, and has intermediates in the true fatherland of the two genera: *Artemisia fasciculata*, Bieb., for instance, has the habit and inflorescence of *Tanacetum*, with the characters of *Artemisia*; and the monotypic genus *Cronostephium* has the habit and inflorescence of *Artemisia*, with the characters of *Tanacetum*. There are other Asiatic species also which have given no small trouble to determine to which of the two genera they should be referred.

The majority of the South-African genera (excluding Cotuleæ) require but little comment, although distributed with the northern genera into different series of the tribe according as their receptacle is with or without paleæ, or their female florets ligulate, tubular, or deficient. A family likeness may be traced between *Athanasia*, forty species, and some fifty species distributed amongst ten or eleven small genera; but no common character can be assigned them. *Gonospermum*, three or four species, from the Canary Islands, forms the nearest approach to *Athanasia* in the northern hemisphere; and *Schistostephium* and *Pentzia* may be compared with *Tanacetum*. *Hippia*, four species, is in some respects an approach to Cotuleæ. But upon the whole these South-African Anthemideæ show a much more remote affinity to the northern ones than would have been supposed, from the genera being not only intermixed in our artificial classifications, but species of the two areas united by some in the same genera. South-Africa has also some small genera quite isolated, although technically, as to structure as well as geographically, included in Anthemideæ, such as:—*Œdera*, four species, with small opposite leaves and a peculiar inflorescence already alluded to; *Eumorphia*, one species, with small opposite decussate leaves, but with a normal inflorescence; *Eriocephalus*, seventeen species, with some of the characters of the distant American subtribes Melampodineæ and Ambrosieæ; and *Lasiospermum*, four species, with the densely woolly achenes of some Arctotideæ.

The *Cotuleæ* form a rather more distinct group of Anthemideæ; and, geographically, they have been so long and so widely dispersed as to have established local genera or subgenera in very distant regions. Generally they belong to the southern hemisphere, and are mostly extratropical; but a few range over the temperate regions of the northern hemisphere of the Old World, or are within the tropics of both the Old and the New. They are generally small annuals or dwarf prostrate perennials with small capitula, the involucral bracts nearly equal in about two rows, the female florets usually numerous, with short, regular or irregular corollas, not strictly ligulate, and sometimes very much reduced or entirely wanting. *Cotula* itself, with about forty species, has the wide range of the whole group; it has been variously subdivided into sections or distinct genera, without any of them (except when monotypical) having any distinct geographical area. *Nananthea*, the only allied genus exclusively northern, consists of a single species from the mountains of Corsica, showing some approach to the *Chrysanthema* and other Anthemideæ of the same Mediterranean region. The slightly diverging genus *Cenia*, eight species, and *Otochlamys*, a single species, are limited to South Africa. *Centipeda*, three species, is more tropical in the Old World, although in America it is only in the southern extratropical regions. *Plagiocheilus*, six species, is limited to extratropical or Andine South America; so would also be *Soliva* (four species?) but for one of them which has established itself in Australia, and another in Portugal and South Carolina, perhaps as ancient, possibly as more modern colonists. *Abrotanella* is yet more southern, ranging from Antarctic America to New Zealand and the southern mountains of Australia. The three remaining monotypic genera, *Ceratogyne*, *Elachanthus*, and *Isoetopsis*, all from extratropical Australia, are somewhat anomalous in their styles and some other structural characters, but can scarcely be so well placed in any other tribe, and certainly with none having similar geographical connexions.

8. *Senecionideæ*.

The tribe of Senecionideæ, next to Asteroideæ the most numerous in species, has, owing to the overgrown proportions of one vast genus, by far the greatest average number of species to a genus: nearly 1400 species are comprised in about 40 genera; but of these species, two thirds belong to *Senecio* itself, reducing the average of the remainder to more ordinary proportions. The tribe is divisible, according to structure, into four somewhat artificial subtribes, which, although generally confirmed by geographical distribution, yet in this respect show some embarrassing exceptions. The principle subtribe, Eusenecioneæ, is truly cosmopolitan; Liabeæ are American, with one tropical-African exception; Tussilagineæ belong to the temperate northern regions, with one South-African exception; Othonneæ to South Africa, with the exception of one widely spread high mountain genus. As a whole, the tribe is distinguished, amongst those which have tailless anthers and a setose pappus, from Vernoniaceæ and Eupatoriaceæ by their yellow disk-florets and frequently heterogamous capitula, and from Asteroideæ by their involucres, habit, and generally, though not always, by their styles.

Senecio itself is not only the largest genus among Compositæ, but one of the largest, if not the largest, among Phænogamous plants, and certainly the most widely spread; truly cosmopolitan and ubiquitous, abounding in local species in almost every region of the globe, in the Old and the New World, from the equator to the arctic regions and the extreme south, on Alpine summits, in stony wastes or sandy deserts, in swamps, on sea-coasts, on the borders of streams, everywhere are *Senecios* to be met with; and yet individually the species have not wide areas. No species is common to the New and the Old World, except in the far north; no one has, I believe its range interrupted by any considerable interval; and notwithstanding the facilities for transport afforded by the proportions of the pappus and the achenes, few have a very wide area, or, as weeds of cultivation, establish themselves in a new country with that readiness so marked in the Conyzoid Erigerons, for instance. It is, moreover, not easy to give any definite centre for the genus. It is less abundant, however, in the tropics, and most varied in temperate and cool or mountain-regions; so that some centre may be vaguely traced in the mountain regions and high latitudes of the northern hemisphere down the Andes from California to Chile, in Antarctic America, Southern Australia, and especially in South Africa. It is not easy, either, to divide it into sections or series by any combination of structural characters and geographical distribution. Although more than forty genera have been proposed for species which we now include in *Senecio*, I have failed in all my endeavours to fix upon even a single group which I could definitely mark out. Besides the vegetative organs, there are differences, it is true, in the achenes, anthers, and styles; but these have been as yet observed in too small a proportion of the known species, or have been found too little in accordance with each other or with habit or geographical relation, to be made available for sectional distinctions. I had observed, for instance, that a number of East-Indian species, erect herbs with entire leaves and numerous few-flowered paniculate capitula, had the auricles of the anthers acute or subcaudate (Pl. IX. fig. 4, 6, or 7), whilst in the majority of species they are truncate, obtuse, or somewhat acute, and then free and approximate to their own filament (figs. 2, 3, and 5); and I thought I had established a good section, to which I gave the name of *Synotios*. I found again the same foliage, and the anthers still more decidedly subcaudate, in some rather tall climbers of the same country, one of which had been generically distinguished by Miquel under the name of *Cissampelopsis*, and I added these to my section, although they differed in the larger many-flowered capitula. In *S. buimala*, Ham., however, another climbing species from the same country with still larger capitula, the character of the anthers failed. In the Canary-Island *S. palmensis*, DC. (the genus *Bethencourtia*, Chois.), the anthers, and in a great measure the habit, were found to be again those of my proposed section *Synotios*, which still might have been kept up; but when I came to the American species, I found the same anthers with pointed connate auricles exemplified here and there in West-Indian or Andine species, which had in other respects no connexion whatever with the above-mentioned East-Indian ones. Again, some North-American species have been retained under the old name of *Cacalia*, characterized mainly by their white-flowered homogamous capitula, with the style-branches produced into short cones and a somewhat distinct habit. The same flowers and styles occur in the South-African *Kleinias* with a totally different habit; and these, again, agree in habit with the Kleinioid *Senecios* of the same country, although the style passes into the common *Senecio* form with truncate tips. The short appendages to the style are more or less distinctly observable in various species, which have on that account been placed in the genera *Cacalia*, *Ligularia*, *Gynoxys*, or retained by all botanists in *Senecio* itself. These appendages, however, are very short and often obscure, and scarcely more than rounded instead of truncate tips, or, as observed by Weddell, deceptions caused by the inequalities in the length of the hairs which form the terminal tuft. I had also long retained the North-Asiatic genus *Ligularia*, in which the collecting-hairs or papillæ descend more or less down the back of the style-branches, accompanied by a peculiar habit, with large subracemose radiating capitula. But here, again, I had ultimately to abandon the separation; sometimes the characters, sometimes the habit and geographical relations were at fault; and at present we are obliged to follow De Candolle in making our primary divisions of the genus purely geographical, and in each country subdivide them according to characters which have locally acquired relative importance. I think, however, that if any experienced monographist were carefully to study the 900 odd species of *Senecio*, and especially to compare the various forms the ripe achenes assume, with the characters derivable from the styles, the anthers, the vegetative organs, and the apparent geographical origins, he might succeed in bringing out sectional combinations which have escaped me, and might even reestablish as independent genera some of those Cacalioid or Ligularioid groups which in the present state of our knowledge I have felt compelled to unite with *Senecio*.

A number of small genera, more or less divergent from *Senecio*, have a much more local character. One only, *Erechthites*, a genus of about a dozen species in a great measure tropical, distinguished chiefly by the filiform female florets, has a wide range. Its great centre is South America; but it is found northwards as far as Carolina; and in Australia and New Zealand it has established several endemic species. In tropical Asia the single species observed is probably a recent introduction from America. In Africa it is, I believe, unknown; the Eusenecioneæ which there assume the above-mentioned main character of *Erechthites* are connected with *Senecio* through different channels.

The other American genera closely connected with *Senecio* are *Culcitium*, about 14 species, and *Gynoxys* (from which, following Weddell, we exclude the alternate-leaved scandent species), about 12 species, both genera Andine. *Culcitium* is very near *Senecio*, differing from some of the genuine species of that genus from the same country only in the involucre; and even in that respect there are intermediate species which have been alternately referred to the one or the other. *Gynoxys*, with more prominent appendages to the style-branches than in the aberrant *Senecios* above alluded to, is also definitely distinguished by the uniformly opposite leaves, which bring it near to some Liabeæ of the same region.

In the tropical regions of the Old World, *Gynura*, about 20 species, including one from Australia, has diverged considerably in the style, which is an approach to that of the Liabeæ; but in all other respects the genus is close to *Senecio*: although enjoying a wide range, its chief centre is Eastern Asia. One African species, the genus *Cremocephalus* of Cassini, has a tendency to exhibit the deviation observed in *Erechthites*, the reduction of the female florets to the slender tubular form; but this character does not here appear to be sufficiently marked or constant to justify the retaining it as a monotypic genus. In the Mascarene Islands there are two genera (*Faujasia*, three species, and *Eriothrix*, one species), a third (*Stilpnogyne*) in South Africa and a fourth (*Melalema*) in Antarctic America, both monotypic, all differing from *Senecio* in the same character, the female filiform florets, but diverging from such very different points of that great genus, that they cannot well be united on this ground, and *Eriothrix* and *Melalema* especially have each a very peculiar habit. In Africa also *Cineraria*, as now reduced to twenty-five species, chiefly southern, with, however, three Abyssinian ones, differs from *Senecio* in the flattened achenes, to which there is no tendency in *Senecio* or its allies in any other country. The New-Zealand monotypic *Brachyglottis* and the Australian *Bedfordia*, two species, are both so near *Senecio* that they have been sometimes merged in it; but they appear at least as distinct as several of the other divergent groups; and *Bedfordia* especially is exceptional in the tribe, and approaches the Australian Asteroideæ (*Oleariæ*) in habit and stellate indumentum.

The genera next in order of divergence from *Senecio* are all extratropical; four are N.W.-American (Mexican or Californian)—*Tetradymia* with three or four species, *Raillardella*, *Crocidium*, *Bartlettia*, and *Haploesthes*, all monotypic, these last three showing perhaps some approach towards Asteroideæ, but on the whole much nearer to Senecionideæ. *Arnica*, about ten species, a mountain genus, extends generally over the central and northern regions of Europe, Asia, and North America; and is distinct, especially in its opposite leaves and its involucre. *Doronicum* (as now modified so as to include *Aronicum* and exclude *Pericallis*) has ten or twelve species, and approaches *Arnica* in involucre and other characters, but with alternate leaves. Its geographical range in Europe and Asia is nearly the same, but less mountainous or northern, and it does not reach North America. *Lopholæna*, a single South-African species with its singular involucral bracts and long style-appendages, is somewhat isolated in its relationships.

There are three insular genera. 1st. *Raillardia* has nine Sandwich-Island species with an insular shrubby habit; A. Gray unites with it as a section the above-mentioned Californian monotypic *Raillardella*, for both have long narrow style-appendages and a plumose pappus; but their habit is so widely different as to suggest their connexion with the Eusenecioneæ having been quite separate; and I have availed myself of some differences in the achenes and pappus to maintain the two as distinct genera. 2nd. *Robinsonia*, four species, and, 3rd, *Balbisia*, one species, are from the isle of Juan Fernandez, where they form small trees of a very peculiar habit. Although their connexion with Eusenecioneæ seems greater than with any other subtribe or tribe, yet in their diœcious capitula, in the presence of small free anthers without pollen in the female florets, and some other points they approach the subtribe Petrobieæ of Helianthoideæ. Their convolute cotyledons have been pointed out as distinguishing them from all other Compositæ; but, as already observed, that character is not constant in *Robinsonia*. In *R. Gayana* the embryo is usually, if not always, precisely that of the great mass of Compositæ.

There remain two genera which show the great difficulty of giving technical characters to what appear to be natural groups, *Werneria* and *Othonnopsis*, the former with the characters of Othonneæ, but evidently more naturally connected with *Senecio*, and *Othonnopsis* as evidently connected with *Othonna*, but with the characters of Eusenecioneæ. *Werneria* is a high mountain genus of about seventeen species, differing from *Senecio* in the involucral scales strictly uniseriate, united to near the middle or higher up in a regular smooth ribless lobed cup, and with a peculiar habit rare in *Senecio*. Its great centre is in the Andes of South America; but one species, unknown to me, has been described from Mexico; and I am unable to separate from *Werneria* generically, either in habit or in character, *Senecio nanus*, Sch. Bip., from the mountains of Abyssinia, nor the *Ligularia nana*, Dcne., from the Himalayas. *Othonnopsis* is an Old-World genus of eight species, chiefly South-African, but with one North-African, one

Arabian, and one Persian species, all nearly allied to the South-African *Othonna* (from which they were first separated by Spach), but with the styles and involucres of Eusenecioneæ.

Othonneæ, excluding the two last-named genera, form a small subtribe of about 130 species in 5 genera, entirely S.-African, with the exception of *Euryops*, which has established one species in Abyssinia and another in Arabia. The three principal genera, *Euryops*, 27 species, *Gamolepis*, 12 species, and *Othonna* (including *Doria*), about 80 species, appear to me to have a very close natural connexion, although usually placed in three widely distinct tribes. *Euryops* is generally acknowledged as a Senecionidea; *Gamolepis*, only differing from it in the want of any pappus, has on that account been referred to Anthemideæ, where it is evidently a perfect stranger; and an occasional absence of pappus in groups usually provided with it has now been observed in too many parts of the system to retain its formerly supposed importance. The third genus, *Othonna*, has been referred to Cynaroideæ, through a false appreciation of the style, which has neither the termination nor the external ring of hairs or so-called articulation of that tribe, but is a genuine Senecionid style with a truncate penicillate tip; only, as the disk-florets are sterile, it remains undivided as in most other tribes under similar circumstances.

Liabeæ is a small subtribe characterized by its imbricate involucre and Vernonioid style. The principal genus, *Liabum*, of about 40 species, is S.-American, chiefly Andine, but extending in a few species into the W. Indies and northward to Mexico. It has been almost universally classed under Vernoniaceæ on account of its style; but the yellow heterogamous usually radiate capitula, as well as the habit, are very foreign to that tribe, whilst there is much that connects it with Senecionideæ. The opposite leaves, though not common in the latter tribe, are to be met with in *Arnica*, *Haploesthes*, and *Gynoxys*; and the style is scarcely so far removed from that of *Gynura* as the latter from the ordinary truncate style of *Senecio*. The W.-Indian and Columbian genus *Neurolæna*, two species, admitted on all sides to be a Senecionid, is very nearly allied to *Liabum*, and, indeed, closely connected with it through *Schistocarpha*, a Mexican and Peruvian genus of four species, with the opposite leaves of *Liabum* and the paleaceous receptacle of *Neurolæna*. The small genera we have included in *Liabum*, differing from each other more in habit than in character, have no separate geographical areas; they are all Andine.

There is, however, a tropical-African monotypic genus which technically would belong to Liabeæ rather than to any other subtribe, but appears to be almost as much isolated in its natural affinities as in its geographical position. This is *Gongrothamnus* from E. tropical Africa, enumerated by De Candolle as a species of *Vernonia*, but differing from the whole of that tribe in its yellow flowers and triplinerved leaves, besides that the style-branches, being minutely papillose and not hairy, are not strictly those of Vernoniaceæ. Its nearest affinities remain yet to be traced out.

The subtribe Tussilagineæ, which, as well as the Liabeæ, we consider as more closely connected with Senecionideæ than with any other tribe, belongs in its normal genera to the mountain or temperate regions of the northern hemisphere. These genera are usually placed amongst Eupatoriaceæ on account of a slight resemblance in the style-branches; but their heterogamous capitula, frequently yellow, remove them as far from Eupatoriaceæ as Liabeæ are from Vernoniaceæ; and here we have, moreover, the prevalence of a truly Senecionid involucre. The subtribe comprises four genera of undoubted affinity—*Tussilago* a single species, *Petasites* about twelve, *Homogyne* three, and *Cremanthodium* four or five species; the first three, constituting the old genus *Tussilago*, are all European, and *Homogyne* exclusively so; the other two extend over Asia and N. America. *Cremanthodium* is Himalayan; only one of its species has as yet been published, and has been referred to *Ligularia*, of which, however, it has neither the habit nor the style; and its affinity to *Tussilago* is confirmed by other species.

Here, again, we have three isolated genera, which we can only class artificially as connected with Tussilagineæ. One is *Luina*, a single N.W.-American species, with something of the habit of an *Inula*, and, indeed, some approach to that genus in the almost setose points to the auricles of the anthers; but these points or setæ are exceedingly short, and scarcely more than observable in some *Senecios*. The involucre is that of *Senecio*, the style-branches between those of *Inula* and *Tussilago*, the geographical position very far removed from that of *Inula*, but quite within the range of Tussilagineæ. *Peucephyllum*, another monotypic N.W.-American genus, referred by A. Gray with doubt to Eupatoriaceæ, appears to me, on account of its yellow flowers and other characters to be referable rather to the present group, although it has even there no near connexions.

The other extraneous genus is the S.-African *Alciope*, with two species, placed by De Candolle amongst Asteroideæ, with which it seems to have much less connexion than with Senecionideæ. Its style is that of *Cremanthodium*; the habit resembles that of *Arnica*, to which Thunberg referred it. It is not nearly allied to any genus of its own country. The anthers are those of the Senecionideæ generally, and remarkable in that those of one species have the contiguous auricles of adjoining anthers connate, in the other the auricles are quite free and closed upon their own filaments.

9. *Calendulaceæ.*

Calendulaceæ constitute the smallest and most compact of the tribes we have adopted, and might almost have been enumerated amongst the subtribes of Senecionideæ (with which it has much more affinity than with Cynaroideæ, under which it is usually classed), but that there is a tendency to produce appendages or tails to the anther-auricles, and there is never any pappus. The sterility of the inner disk-florets, sometimes accompanied by a similar sterility in the ray, and the large size acquired by some or all the perfect achenes are also peculiarities, which justify the maintenance of the group as a distinct tribe. It is almost entirely African. Of the three largest genera, two (*Dimorphotheca*, twenty species, and *Osteospermum*, thirty-eight species) are exclusively S.-African; *Tripteris*, twenty-eight species, is also S.-African, but has likewise a North-African subtropical or tropical species. *Oligocarpus* has three S.-African species and one in the island of St. Helena, whether aboriginal there or whether an introduction from S. Africa, and being yet to be discovered there, remains doubtful. *Calendula*, with scarcely ten species, although double that number have been described, belongs to the Mediterranean region, extending from the Canary Islands to Persia. *Dipterocome* is a curious anomalous monotypic Persian genus, evidently allied to *Oligocarpus*, but thus placed on the limits of the tribe both structurally and geographically. *Eriachænium* is another monotypic genus, which Schultz has correctly referred to this African tribe, although it comes from a distant land, Antarctic America. It is anomalous in habit, but nearer to *Oligocarpus* than to any other genus.

Ruckeria, two species, is a true S.-African, and appears closely to connect Calendulaceæ with Senecionideæ (Othonneæ); but the specimens preserved are as yet insufficient to make us fully acquainted with its characters and affinities.

10. *Arctotideæ.*

The Arctotideæ, although twice as numerous, both in genera and species, as the Calendulaceæ, form still a small Old-World tribe, with their chief area in S. Africa, where, however, they have no immediate connexions. They pass on the one hand rather gradually into Cynaroideæ, an Old-World tribe it is true, but almost exclusively of the northern hemisphere; and at the other end they seem in some measure connected with some of the Anthemideous genera of the Northern, not of the South-African type. On the whole they may perhaps be considered the southern representatives of the Cynaroideæ, with which Lessing and De Candolle associated them, but from which they differ essentially in their usually radiate heterogamous capitula, to a considerable degree in their styles, in the constant deficiency of tails to the anthers, and, as above, in their geographical distribution. They consist of three or, perhaps, rather four subtribes, which must be reviewed separately.

1. The genus *Ursinia* (including *Sphenogyne*) forms a distinct group of about 54 species, all S.-African, although one of them reappears in (or extends into) Abyssinia, differing from Arctotideæ generally in their truncate style-branches, their paleaceous receptacle, and glabrous foliage. It appears to me, however, to be more nearly connected with Euarctoteæ than with any other tribe or subtribe. De Candolle placed it among Helenieæ, where it has certainly no connexions, structural or geographical. The peculiar paleæ of the pappus, distinctly convolute-contorted in their arrangement, are much more those of *Arctotis* itself than of any Helenioideæ. The habit and involucre connect them with some Anthemideæ of the northern type, as well as with several of the true S.-African Euarctoteæ.

2. The *Euarctoteæ* comprise seven genera and about fifty species, with the broad involucres of which the inner bracts are scarious at the end of some of the northern genera of Anthemideæ. They approach that tribe also in their pappus reduced to scales or entirely wanting, but differ in the styles approaching those of

Cynaroideæ, in their achenes usually larger and thicker, and in other points. Their main area is S. Africa. *Arctotis* itself, out of thirty species, has one in Abyssinia; *Landtia*, four species, has two S.-African and two Abyssinian; *Haplocarpha*, four species, *Arctotheca*, one species, and *Venidium*, eighteen species, are exclusively S.-African, although one species of the first extends rather within the tropical limits. *Cryptostemma* has three species, of which one has become perfectly naturalized in Portugal; and *Cymbonotus*, one species (the only one known of the tribe which is not African), has hitherto been only gathered in Australia, where the earliest explorers found it fully established and apparently indigenous. It is totally disconnected from any Australian genus, and it diverges much less from the S.-African genera of Euarctoteæ than the Magellanic *Eriachænium* above mentioned does from the Calenduleæ; the origin of both is as yet inexplicable.

3. The *Gorterieæ*, with the chief characters of Euarctoteæ, differ from them in the involucres and some other points, which bring them nearer to Cynaroideæ, of which they may be considered the S.-African representatives, differing in their radiate capitula, and more or less in their styles and other points. We have here, therefore, among these Old-World tribes, the Anthemideæ of the *Anthemis* and *Chrysanthemum* type, all belonging to the northern hemisphere, connected with the Cynaroideæ, also all northern, not by any northern groups, but through the almost exclusively southern Arctotideæ; whilst the intermediates between the southern Anthemideæ of the *Athanasia* group and the southern Arctotideæ are to be sought for exclusively among the northern Anthemideæ.

The Gorterieæ comprise about 120 species in seven genera, which do not appear to require any separate mention here; for they have all the same S.-African range, with here and there a species extending to within the tropics, but none, I believe, passing the equator. None have established themselves, even as introduced weeds, into distant lands.

4. *Gundelia*, a single Persian species, and *Platycarpha*, two S.-African species, are two very distinct anomalous forms, which, from some mistaken observation of their styles, had hitherto been placed amongst Vernoniaceæ, next to *Elephantopus*. The only connexion with the latter genus appears to be that of numerous few-flowered capitula being collected in a close general cluster or compound head. But that character exists in Asteroideæ, in

Inuloideæ, in Helianthoideæ, and in Cynaroideæ; and our two genera are in other respects totally at variance with Vernoniaceæ. They appear to me to have the style and several other characters of Arctotideæ, and really almost to close up the gap between the S.-African Arctotideæ (Gorterieæ) and the northern Cynaroideæ (Echinopsideæ); and one genus has the geographical position of the former, the other of the latter, both included in the general range of the two tribes.

11. *Cynaroideæ.*

The Cynaroideæ form the largest tribe in the northern hemisphere of the Old World, where they do not, with the exception of one very widely spread eastern species, cross the tropics southward, their only extension, and that a sparing one, being into N. America and thence down the western ranges of mountains to Chili, with one Australian species. They comprise near 900 species in about 36 genera; the subtribes into which they are divided are not well marked out, or, in some respects, perhaps too artificial, although there are some very distinct genera. As a whole, taking geographical distribution into account as a check upon structural characters, the tribe is definite in its limits; their habit, involucre, receptacle, corolla, anthers, and styles are all characteristic, and though each one may show exceptions, these exceptions never occur in all the organs at once. Their nearest connexions are with the Mutisiaceæ on the one hand, and the Arctotideæ (Gorterieæ) on the other; but the nearest connecting genera belong to these tribes respectively, and not to Cynaroideæ. Not following precisely the subtribes of the 'Genera Plantarum,' we will consider successively six prominent genera—*Centaurea*, *Saussurea*, *Cnicus*, *Carlina*, *Xeranthemum*, and *Echinops*, taking under each the smaller genera more or less diverging from them—the first three of which are the only ones of the tribe which extend into America. The great centre of the whole tribe is the Mediterranean region, taking it in its extended area so as to include Persia; and many genera are limited to its eastern portion.

Centaurea, as most generally understood, is a genus of about 320 species, having the geographical range of the tribe, most abundant in the Mediterranean region and the Levant, but extending in America and Africa to the utmost limits of the general area of Cynaroideæ. Although very fairly defined as a whole, it presents such infinite variety in the tips or appendages of its involucral scales and in the pappus, that it has been split up by Cassini and others into above fifty genera. Cassini's, founded chiefly on the involucral scales, are, perhaps, the most natural; those of De Candolle, Spach, and Boissier, derived mainly from the pappus, may be rather more definite, but are very artificial, often widely separating species otherwise closely allied; and very few of the groups formed on either grounds have any local character. The very few American species (North-western or Chilian) are connected with each other by their large capitula with broad fringed or torn scarious appendages to their involucral bracts; but the nearest approach to these are from the diametrically opposite limits of the general range—two Abyssinian species, which Boissier has even proposed to add to the genus *Plectocephalus*, founded on the American ones. The Abyssinian ones, however, are really, notwithstanding their pappus, more nearly connected with some of the European or Asiatic species of the *Lopholoma* group. A species still more remarkable for its distant outlying station is the Australian *Leuzea australis*, Gaudich., which we now find it necessary to associate with the section *Rhaponticum* of *Centaurea*. It is in some measure allied to the Abyssinian and West-American large-headed species above-mentioned; but its closest affinity is with a Spanish species, the *Leuzea rhaponticoides* of Graells.

A considerable number of the species have a rather wide range within the general area; and some appear to hybridize readily. *C. nigra*, belonging chiefly to temperate regions, extends over the greater part of Europe and extratropical Asia; and two species, *C. calcitrapa* and *C. melitensis*, are frequently carried out in ballast or as weeds of cultivation to distant lands. A large number, however, of the species are restricted to small areas.

The small genera *Crupina*, two (or, according to some, five) species, *Volutarella*, four or five species, *Zoegea*, two species, and *Leuzea*, one species, all slightly diverging from *Centaurea*, belong to the same Mediterranean region taken in an extended sense E. and W., but do not spread northwards.

Carbenia, one species, *Carthamus*, about twenty, and *Carduncellus*, about fourteen species, belong still to the *Centaurea* group and Mediterranean region, more abundant in the west than in the east, the chief character connecting all the above genera consisting in the very oblique or lateral scar at the point of attachment of the achenes.

The same character of the achenes, though perhaps usually no so much pronounced, prevails in the allied genera *Serratula*, about thirty species, and *Tricholepis*, seven species; but a very perceptible difference in the involucral scales gives them a different habit, and their geographical range is not quite the same; they are more northern and eastern, and not quite so Mediterranean. *Serratula* itself is, moreover, somewhat exceptional in the tribe by the great reduction or almost total suppression of the tails or appendages to the anther-auricles. This genus extends over the whole of Europe and temperate Asia, but is not in America. *Tricholepis* is exclusively Asiatic.

Myopordon is a monotypic Persian genus of which the affinities are as yet very uncertain. It is evidently near the *Centaureæ* with spinous involucres; but the areola at the point of attachment of the achene seems to be quite basal; the specimens, however, are imperfect.

The *Saussurea* group of genera have the basal scar to the achenes of the *Cnicus* series; but their filaments are always glabrous and free, and their involucral bracts, having neither the prickles of the majority of the *Cnicus* series nor the scarious appendages so frequent in *Centaurea*, give to the plants a very different facies. *Saussurea* itself, about sixty species, is also distinguished by the pappus, either with a single row of setæ or the external setæ comparatively few, fine, and short. Geographically it is of a much more mountainous character, with some species consequently of a much wider range than most Cynaroideæ. It has several high-Alpine or Arctic species, and extends over Europe, extratropical Asia, and rather high northern America: two or three species descend in Asia to within the tropics; and one of these Asiatic species has extended itself into eastern Australia to the utmost limits of, and even beyond the tropical region.

Stæhelina, six species (including possibly the monotypic *Kœchlea*), is, as it were, the Mediterranean representative of *Saussurea*, and has also a single-rowed pappus, but of a somewhat different texture, and the setæ mostly united in pairs or in bundles. It is limited to the Mediterranean region.

Jurinea, about forty species, has much of the aspect of *Saussurea*, and is divisible, chiefly according to inflorescence, into sections corresponding to those of *Saussurea*, some of them, perhaps, rather more distinct; and one, *Ægopordon* of Boissier, with the setæ of the receptacle almost as much reduced as in *Onopordon* and *Berardia*, might, perhaps, be retained as a monotypic genus. As a whole, *Jurinea* differs from *Saussurea* chiefly in the multiseriate pappus. It is less mountainous than that genus, and more Mediterranean in its character; it does not extend to the Arctic regions or to America, although abundant in Asia. The monotypic *Goniocaulon*, from East India, and *Berardia*, also monotypic, from the western extremity of the Alps, though distant from each other, are very near to different sections of *Jurinea*. *Warionia*, from the Sahara of Africa, and therefore from the extreme limits of the Cynaroid-area, is a very distinct form, although still referable to the *Jurinea* group.

Of the Carduinæ proper, or true Thistles, with the leaves and involucres usually prickly, the filaments hairy or monadelphous, the areola or scar of the achenes basal, and the pappus-setæ in several rows, *Cnicus*, above 150 species, is the largest as well as the widest-spread genus. Like *Centaurea* it is diffused over the whole of the Mediterranean region, Europe, and extratropical Asia, from the Canary Islands to Japan, and extends also into North America and down the western mountain-range to the tropics, but scarcely beyond; and two or three species are readily carried with cultivation into the tropics and beyond them. Like other large Cynaroid genera it has been divided; but none of the genera proposed to be dismembered from it among the great mass of Old-World species have any natural structural character or special geographical range. In America, however, it appears to have been very early established in the Mexican region, and there to have diverged more or less into a special group with large heads and peculiar, often highly coloured, involucres, culminating in the *Erythrolæna* of Don, which, however, is too closely connected through a long series of intermediates with some of the Old-World forms to be maintained as a genus. The whole genus *Cnicus* is often merged in *Carduus*, the two differing only in the pappus, plumose in the one, simply setose in the other, and naturally forming but one group. The geographical range would not be materially affected by the union, except that *Carduus* in the limited sense, with between thirty and forty species, has a much more restricted area than that of *Cnicus*, being unknown in America.

Onopordon, twelve species, *Cynara*, six, *Silybum*, one, *Galactites*, two, and *Tyrimnus*, one species, are all forms very slightly diverging from *Carduus* and *Cnicus*; and all belong to the Mediterranean region taken in a wide sense, *Cynara* extending to the Canary

Islands; and one species carried out with man to extratropical S. America, has there found circumstances so congenial to its constitution that, as a successful colonist, it has overpowered the native vegetation over vast tracts of country. None are truly American or high-northern.

Cousinia is another genus of true Thistles, differing from *Carduus* and *Cnicus* in the slender, fragile, usually small and exceedingly caducous setæ of the pappus, and remarkable for the large number of species confined to a small area. Above 100 well-marked species have been described; and many more exist in our herbaria, although the whole genus is limited to Western and Central Asia, the chief centre of its range being in Persia; and at its western extremity it barely reaches the Mediterranean.

Arctium is a small European and temperate Asiatic genus, of which the number of species, whether two or seven or eight, is a matter of contention, and which, though not prickly, is but a slight divergence from *Carduus*, with a pappus nearly that of *Cousinia*.

The *Carlina* group includes three closely allied genera which might be treated as one—*Carlina* itself, fourteen species, *Atractylis*, about the same number, and *Thevenotia*, two species. They connect the *Carduus* and *Cnicus* group with the *Xeranthema*. With the prickly thistle-like aspect of the former, they have the densely villous achenes and simple series of more or less paleaceous pappi of the latter. Geographically they are widely spread, although they do not reach America. Their chief seat is the Mediterranean region; and one or two species extend over the greater portion of Europe and extratropical Asia. They have also, always within their general Old-World range, established some local forms distinct enough to have been often considered genera. These are *Carlowitzia* (belonging to *Carlina*), two species in the Canary Islands, *Thevenotia*, two species in Persia, and *Atractylodes* (now reduced to *Atractylis*), two species in Japan and China. *Atractylis Preauxii* is another Canary-Island form, which might almost be regarded as *sui generis*. The corollas of the sterile florets at the circumference of the capitula in *Atractylis* assume the palmate or 5-merous ligulate form which, as in *Stokesia*, indicates an approach to the Cichoraceous corollas, not to those of the rays of ordinary radiate capitula.

Xeranthemum, four or five species, and the closely allied monotypic *Chardinia* and *Siebera* form a small very distinct group of Cynaroideæ, limited to their great centre the Mediterranean region and Levant. In habit, achenes, and pappus they show some approach to *Catananche* in Cichoriaceæ; in involucre a distant resemblance, but no affinity, to Helichryseæ; their external female or neutral florets tend towards the bilabiate form of Mutisiaceæ; but their main characters are so essentially those of Cynaroideæ, that they cannot be really considered much in the light of connecting links with either of the above outlying tribes.

Amphoricarpus is a monotypic Dalmatian genus, with which I am not sufficiently acquainted to form any opinion on its supposed relationship to *Xeranthemum.*

Echinops, including the small almost monotypic genus or section *Acantholepis,* forms an exceedingly distinct group of nearly seventy species, ranging over the Mediterranean region, the Levant, and Central Asia, which, in the numerous uniflorous capitula collected in dense globular clusters or compound heads, have the same relation to the true Cynaroideæ that the Gundelieæ have to the Arctotideæ. To a certain degree also there is here some approach of the two tribes to each other; but the gap is still wide. On the other hand, *Cardopatum,* of two species (one from Algeria, the other from the Levant, and therefore from the same region), may be said to form a connecting link between *Echinops* and *Carlina.*

12. *Mutisiaceæ.*

The Mutisiaceæ are varied in form and widely scattered in geographical position. About 450 species are contained in 50 genera, the chief centre of which is far distant from that of the tribes they are most nearly connected with, although there is some overlapping of their respective areas. They are most nearly allied in structure, though most opposed geographically, to Cynaroideæ; some genera (Gochnatieæ) have almost the characters of that tribe; and there is scarcely a very definite line between the same Gochnatieæ and Inuloideæ (Euinuleæ), whilst there are some genera also which (with *Stokesia* in Vernoniaceæ) exhibit the nearest approach in the order, though still but a distant one, to Cichoriaceæ. The chief centre of Mutisiaceæ may be said to be Western, and especially South-western, America, where Cynaroideæ are not represented by any endemic genus and are very slightly so by a few outlying species of large European genera, where Euinuleæ are unknown and Cichoriaceæ few; whilst the Mediterranean region, the great centre of Cynaroideæ and Inuloideæ, and in a considerable degree that of Cichoriaceæ, is entirely deprived of Mutisiaceæ, or at most has a single species on its extreme southern limits. The five subtribes into which the tribe is divided on structural grounds are not very strictly geographical: Barnadesieæ are South-American; Onoserideæ also South-American, with the exception of two or three tropical-African forms; Gochnatieæ and Gerbereæ have several representatives in Asia and Africa; Nassauvieæ are exclusively American and chiefly, but not entirely, western and extratropical. It is better, however, here to consider the genera of the first four subtribes rather more in the order of their geographical areas.

Barnadesia, ten species, *Mutisia*, thirty-six species, *Onoseris*, about twelve species, *Chuquiragua*, above thirty species, all very distinct and well-defined genera, are all South-American and Andine, but each one extending eastward in one or more Brazilian species (in *Chuquiragua* nearly half the species often separated under the name of *Flotovia*) without any connexion with the Old World. Round the above may be grouped three small Andine genera, *Plagia*, three species, and *Aphyllocladon* and *Chionopappus*, both monotypic, as well as three very distinct small genera from east tropical America (Brazil or Guiana), *Schlechtendahlia* and *Wunderlichia*, both monotypic, and *Stifftia*, four species, which might almost be considered as two or three distinct genera. Three tropical-African forms also (*Pleiotaxis*, one species, *Erythrocephalum*, two or three species, and *Phyllactinia*, one species) appear to be more nearly connected with the American *Onoseris* group than with any genera of their own country.

Gochnatia, ten South-American tropical or extratropical species, *Moquinia*, twelve species, all Brazilian except one from Mexico, together with *Seris*, two Brazilian species, and *Hyalis* and *Cyclolepis*, both monotypic and extratropical South-American, all closely allied to each other, form a rather natural group approaching in many respects some Cynaroideæ (of the *Saussurea* group), and more remotely connected with some Euinuleæ. This group is represented in Cuba by the genus *Anastraphia*, four species; in southern and in a less degree in tropical Africa by *Dicoma*, thirteen species, and *Hochstetteria*, one species; and still more closely in the Himalaya by the monotypic *Leucomeris*, scarcely distinguishable from *Gochnatia* itself, except by the corymbose inflorescence.

The African genus *Dicoma* above mentioned, of which one of the tropical species extends into East India, includes various forms with great diversity in habit, involucre, and pappus, but so connected with each other as to render it difficult to distribute them even into well-marked sections; the most marked form, some species of the section *Pterocoma*, DC., offer the only instance of some approach in outward aspect to the above-mentioned Brazilian *Schlechtendahlia*.

Trichocline, about twenty South-American extratropical, subtropical, or Andine, with one Australian species, *Chaptalia*, eighteen South-American tropical or extratropical species, represented also in Mexico and the southern United States of America, and *Gerbera*, twenty species, chiefly South-African, but with a few tropical or mountain species dispersed over tropical Africa, East India, and Eastern Asia as far Japan, form one natural group, divided by some into about sixteen genera, but fairly separable into the three above mentioned; for I think there are structural characters fully sufficient to separate the American *Chaptalias* from the Old-World *Gerberas*, with which Schultz Bipontinus unites them. All three genera have a uniform habit, the leaves all radical, usually white underneath, and monocephalous scapes. The single Australian species, which I had once described as a genus under the name of *Amblyspermum*, I now find to be inseparable from the South-American *Trichoclines*.

Lycoseris, ten species, all South-American and chiefly Andine, extending from Bolivia to Central America, *Chætanthera*, twenty-six species, and the monotypic *Brachyclados* and *Iobaphes*, all extratropical or high Andine, belong to the same *Gerbera* subtribe, but are very distinct from the three last-mentioned genera, and are unrepresented in the Old World.

Four small genera with a considerable family likeness, although each with well-marked structural characters, *Ainsliæa*, ten species, and the monotypic *Macroclinidium*, *Pertya*, and *Myripnois*, are Asiatic and Eastern Asiatic, and mostly extratropical or Chino-Japanese. The last-named three genera have much of the character of some of the *Gochnatia* group, especially of the Cuban *Anastraphia*, but also show an approach to some Cynaroideæ, as, for instance, to the (similarly Japanese) section *Atractylodes* of *Atractylis*. *Ainsliæa*, on the other hand, which descends sparingly to within the tropics, has somewhat of the habit, though not much of the characters, of some Cichoriaceæ; and one species was originally described as a *Hieracium* (*H. silhetense*, DC.). A very curious monotypic genus, however, from the Siwalik hills of East India, *Catamixis* of Thomson, has really the pentamerous regularly 5-toothed corollas of Cichoriaceæ, but with the anthers, styles, achenes, and involucres of Mutisiaceæ, thus forming a real point of connexion between the two tribes. The habit is an uncommon one in either tribe, being rather that of a *Baccharis* or a *Pluchea*.

There are two very exceptional South-African genera which can only be referred to Mutisiaceæ, but for which I can suggest no near connexions:—*Anisochæta*, a single species, which, probably from some vague resemblance to *Mikania* in its climbing habit, paniculate inflorescence, and few-flowered capitula, had been placed by De Candolle in Eupatoriaceæ, of which it has neither the anthers nor the style, nor the corolla, nor the opposite leaves. Though far distant, yet it appears to me to be better placed near the *Gochnatia* group than in any other position I can assign to it. The other is *Oldenburgia*, three species, perhaps not strictly congeners, with all the essential characters of the *Gerbera* group, but in their singular habit coming nearer to the Brazilian *Wunderlichia*, belonging to the *Gochnatia* group. The only American plant of the *Gerbera* group approaching it in habit is perhaps the Chilian monotypic *Pachylæna*.

Hesperomannia is an insular (Sandwich-Island) monotypic genus of the *Gochnatia* group, of arborescent habit, with the large capitula, achenes, and pappus of the Brazilian typical *Stifftia*, from which it differs in the involucre and style.

The fifth subtribe, Nassauvieæ, with the corollas more constantly and distinctly bilabiate than several of the preceding subtribes, has also rather different connexions, having generally the styles and occasionally the involucres of Senecionideæ. It is exclusively American, chiefly southern and western, extending into North America only along the Mexican region to California. The genera, as consolidated by the most recent synantherologists (without going quite so far as Schultz Bipontinus), are natural and well defined, some of them quite isolated except as to the general tribual characters. *Perezia*, forty, and *Trixis*, thirty species, extend from the Argentine States and Chili to Mexico, with one or two more eastern tropical species in Brazil or the West Indies. *Proustia*, six or seven species, very nearly allied to *Perezia*, with the habit of some *Gochnatiæ*, is generally South-Andine, but is also represented in Mexico. *Jungia*, with twelve species, very near *Trixis*, does not reach further north than Columbia. *Leucæria*, twenty-five species, *Polyachyrus*, seven, *Nassauvia*, twenty-five, *Triptilion*, six, *Pamphalea*, four or five species, and the monotypic genera *Oxyphyllum* and *Moscharia* are limited to extratropical South America, chiefly Chili, or they advance very little northward along the Andes. *Macrachænium* is a single Magellanic species with the habit of a *Chaptalia*, and the characters nearer those of *Trixis*; and *Cephalopappus* is a single and rare Brazilian species, with the characters nearly of the Chilian *Pamphalea*, but a totally different habit.

13. *Cichoriaceæ.*

The tribe of Cichoriaceæ is an extensive one, and, as already observed, is the most definitely marked out in the whole order. It has also a wide geographical range. Its chief seat is in the northern hemisphere and more especially the Old World, where most of the larger genera have the great majority of their species. Most of the genera of limited areas belong to the Mediterranean region; yet several are also located and have been apparently developed in Western America, especially in the Mexican region. The number of species known is above 700, distributed into nearly 60 genera, not always very clearly defined, yet we believe rather better marked out than the very numerous smaller ones into which they have sometimes been divided. It is very difficult to arrange these genera into subtribes; and those we have adopted are in a great degree artificial, and have little or no connexion with geographical distribution; we must therefore now consider the principal genera separately.

Crepis (including *Barkhausia* and *Youngia*), about 130 species, to which might be added about a dozen more contained in the small slightly divergent genera *Pterotheca*, *Phæcasium*, *Phalacroderis*, and *Rodigia*, is essentially of the Old World. The few N.-American species, although proposed by Nuttall as two distinct genera, *Psilachenia* and *Crepidium*, belong to the typical group of *Eucrepis*. The genus is divisible into twelve to fourteen sections, not all very distinct, but each marked by some peculiarities. Most of them, as well as the four small divergent genera above mentioned, belong to the Mediterranean region; two, *Eucrepis* and *Barkhausia*, range over Europe, N. Africa, and extratropical Asia; and the former, *Eucrepis*, extends also into N. America; the sections *Soyeria* and *Intybellia* belong to the mountain-regions of Central Europe and Asia, and are replaced in the Mediterranean region by numerous species of the section *Omalocline*, some of which are also Alpine, but only in the southern ranges of mountains. *Youngia* is more Asiatic and especially eastern; one species is tropical and extends to the northern districts of Australia. The *Anisoramphus* proposed by De Candolle as a genus, but which we have with some hesitation reduced to a section, is a single tropical-African mountain species.

Hieracium, about 150 species, increased by some botanists to between 200 and 300 or even more, has a geographical range unusual in Compositæ, upon which climatological influences may have had some effect. It belongs chiefly to mountainous or temperate regions; and in the Old World it is essentially western, from Scandinavia to the Spanish Peninsula and the Western Alps; in Eastern Europe the species are more rare, and in Asia very few. In America they reappear in the extratropical regions N. and S., and down the range of the Andes; and two species are in the southern hemisphere in the Old World, one in S. Africa, the other in Madagascar; none are known in Australia. The genus is divided by Fries into three principal and natural sections—*Pilosella*, *Archieracium*, and *Stenotheca*. The first two comprise nearly the whole of the Old-World species of the northern hemisphere. *Stenotheca* is represented in the Old World by one or two species of the Western Alps, and by the two southern species above mentioned, all evidently nearly allied. The American species, of which Fries enumerates forty-five, but which are probably reducible to little more than half that number, have been, with the exception of two or three high northern *Archieracia*, referred by that writer to *Stenotheca*, to which they appear certainly for the most part nearer than to *Pilosella*, to which Schultz Bipontinus refers them; they have, however, to a certain degree a facies of their own, passing, perhaps, from the one to the other, but not representing the *Archieracia* excepting as congeners. The small genus *Andryala*, variously estimated at from half a dozen to above a dozen species, is a slight divergence from the European *Hieracia*, with the same western character but more southern, from the Mediterranean region to the Canary Islands.

Picris, about twenty-four species, has its chief seat in the Mediterranean region, especially its western portion, extending also down to the Azores: two species are generally spread over Europe and Western Asia; and one is to be found in most parts of the world, especially the extratropical world north and south, and has received a separate name in almost every country, although the distinctive characters given might be generally found in European specimens. It is so readily carried, however, with cultivation, that it is difficult to say how far it is a denizen or a colonist only in the distant regions where it is found.

Sonchus, with about the same number of species (twenty-four) as *Picris*, is similarly circumstanced as to geographical distribution, the chief seat being the Mediterranean region and the Canary Islands, with one or two species everywhere accompanying cultivation and possibly true denizens in more than one distant extratropical region ; but neither the one nor the other has established any endemic groups or distinct species beyond the main area of the genus.

Lactuca, sixty species, nearly allied to *Sonchus*, has a much wider range, and is generally more eastern. It is, however, divisible into five or six sections, somewhat different in their geographical distribution. *Brachyrhamphus* and *Phœnixopus* belong specially to the Mediterranean region. *Scariola*, containing the typical Lettuces of many botanists, is more generally spread over Europe and a great part of Asia ; *Cicerbita* and *Mulgedium*, especially the numerous and showy blue-flowered species, are frequent in mountain-districts, and extend over Europe, central and temperate Asia, and N. America, with endemic species in each country. *Ixeris*, again, is yet more eastern Asiatic, with one European species, and bears much the same relation to *Lactuca* generally which *Youngia* does to *Crepis*. *Chorisma*, allied to *Ixeris*, consists of a few species scattered over various parts of Asia, from Asia Minor to Japan.

Prenanthes, sixteen species, nearly related to the section *Cicerbita* or *Mulgedium* of *Lactuca*, has the same range, chiefly mountainous, over Central Europe, the mountains of Asia and N. America. The other genera diverging from *Lactuca* and *Sonchus* are limited to the northern hemisphere of the Old World. *Chondrilla*, fifteen species, extends over the Mediterranean region and a great part of temperate Asia. *Picridium*, variously estimated at from five to ten species, and *Microrhynchus*, about twenty species, belong to the Mediterranean region, the latter extending into north tropical Africa and the Canary Islands. *Heterachæna*, one species, is Abyssinian and Arabian ; and the monotypic *Dianthoseris*, allied to *Lactuca*, but with the habit of a *Werneria*, is limited to the mountains of Abyssinia. Five small rather more distinct genera, comprising amongst them only eleven species, connected in some measure both with *Crepis* and *Lactuca* (viz. *Zacintha*, *Acanthocephalus*, *Heteracia*, *Rhagadiolus*, and *Kœlpinia*), are also limited to the Mediterranean region.

Leontodon, about forty species, is another of the Mediterranean genera which has a few species widely spread over Europe and extratropical Asia, and two or three are now to be met with in various distant regions, but probably as colonists only, except in North America, where Torrey and Gray's monotypic genus *Apargidium* may be considered as an endemic species of *Leontodon*, nearly related to one of the European mountain species. The genus has been broken up into ten or twelve sections or genera; but they are either monotypic or have no special area, and all belong to the same general Mediterranean region.

Taraxacum, nearly allied to *Leontodon*, and variously estimated at from four or five to above forty species, has a very wide distribution, accommodating itself to every variety of station (thus accounting for the intricate variability of its forms) and readily colonizing. The extratropical regions of the northern hemisphere comprise its chief centre; and it may be more universal in the Old World than in North America; but it appears to be also a true denizen of the far south, both in America and Australia, and is to be met with even in warmer regions.

The genera *Troximon*, sixteen species, *Pyrrhopappus*, three or four species, *Calycoseris*, two species, and the monotypic *Glyptopleura* are all American and almost exclusively north-western, with their chief centre in the Mexican region (including California). *Troximon* reappears in one or two species in extratropical South America, and *Pyrrhopappus* extends somewhat eastward in North America. These genera are quite absent from the Old World; but they may in some measure be considered as West-American representatives of *Leontodon* and *Taraxacum*.

Hypochœris, about thirty species, allied to *Leontodon* in habit and structure, has a wider general distribution, and a rather more American character. Common to both the New and the Old World, with two species so generally distributed and so readily colonizing as to make it difficult to say where they are most at home, *Hypochœris* has perhaps most species in the mountain and temperate regions of America, especially South America, but the most diversified forms in the Mediterranean region of the Old World. Minute differences in the pappus have induced its general division into three or more very artificial genera. Taking more natural, though not always very well-defined, sections, *Achyrophorus* and *Serioloides* are common to the New and the Old World, *Oreophila* is exclusively Andine, *Amblachænium* is a single Siberian species, *Euhypochœris* and *Porcellites* are the two cosmopolitan species, *Seriola*, *Metabasis*, *Robertia*, and *Arachnites* form a small group exclusively Mediterranean.

Malacothrix, about nine species, and the monotypic *Anisocoma* allied to it are Californian genera, in some respects allied to *Hypochœris* and perhaps to *Hieracium*, but forming a very distinct local group.

Tragopogon, about thirty species, and *Scorzonera*, about one hundred, are widely distributed over the temperate and even subtropical regions of the northern hemisphere in the Old World, with their chief seat again in the Mediterranean region, to which belong also a few small local genera slightly diverging from them:—*Urospermum*, two species, of which one reappears in South Africa, but probably as a rather old colonist; *Epilasia*, five species or varieties, from the Persian region; and *Tourneuxia*, one species, from the deserts of South Algeria. None of these genera extends to America; but the group or subtribe may be said to be in some measure represented in North-west America and the Mexican region by *Lygodesmia*, five or six species, *Stephanomeria*, about eight species, *Scorzonella*, two or three species, and the monotypic *Pinaropappus*, and in extratropical South America by the monotypic *Picrosia*.

Tolpis, fifteen to eighteen species, belongs to the Mediterranean region, more especially the western portion, and extends to the Canary and Azores Islands, where it has established endemic species; the monotypic Spanish *Hispidella* is also allied to it; and no nearly related form is known from any distant region.

Hyoseris, four species, is also peculiar to the Mediterranean region and nearly surrounding districts. *Arnoseris*, a single species diverging from *Hyoseris*, is more generally spread over Europe, especially the western districts, and is a ready colonist in Australia and some other countries. These genera may be said to be in some measure represented in America by *Microseris*, twelve species, *Krigia*, four or five species, and the monotypic *Phalacroseris*, all northern and chiefly north-western, except one species of *Microseris*, which, from extratropical South America, extends to Australasia.

Lapsana, belonging to the extratropical regions of the northern hemisphere in the Old World, has one European species very widely spread, and is found as a colonist in North America as well as in other distant parts of the globe. The genus, however, is truly represented in North America by the nearly allied monotypic *Apogon*, a Japanese species of *Lapsana* being almost intermediate between the common one and this *Apogon*.

Cichorium is a very distinct genus, of which one species is widely distributed over the northern hemisphere in the Old World, readily colonizing in many other districts; and a second is limited to the eastern and southern portions of the Mediterranean region. The cultivated Chicory, often given as a third East-Indian species, is probably only a cultivated modification of the common *C. Intybus*. The genus is wholly unrepresented by any endemic American form.

Catananche, five species, and the monotypic *Hymenonema* and *Hænseleria* form a very distinct Mediterranean group unknown elsewhere; *Hænseleria* is western, *Hymenonema* eastern; *Catananche* is both.

Scolymus, three species from the same region, is still more isolated in habit and foliage, which is almost that of a thistle, and in structure, which, except in those invariable characters which place it among Cichoriaceæ, is unlike that of any other known Compositæ.

We have finally two very remarkable arborescent insular genera; *Dendroseris*, seven species, from the island of Juan Fernandez, and *Fitchia*, one species, from the Pacific islands. Both are truly Cichoriaceous in their corollas, anthers, and styles, and *Dendroseris*, at least, in the milky juice of its bark; but their achenes are different from those of Cichoriaceæ generally, as well as their involucres and habit; and *Fitchia*, in its receptacular paleæ, awned achenes, &c., recalls the Helianthoideæ.

Having thus rapidly sketched out the principal facts which have struck me in the investigation of the geographical distribution of the genera of Compositæ, as compared with their structural characters, we may proceed to the inquiry as to how far they can assist us in the solution of the two great problems:—Which, amongst the numerous types or generic forms now exhibited by the order, represent the most ancient races, the nearest to the primitive form of the order? And what are the principal centres where the greater number of the present races appear to have been differentiated, and whence they have spread over the areas they now occupy, thus establishing more or less distinct regions? —these centres of individual races to be carefully distinguished from the supposed *centres of creation* or *centres of vegetation*, from which whole diversified floras are supposed to have radiated, and to the fallacy of which I specially alluded in my Address of 1869.

B. Comparative Antiquity of Races in Compositæ.

If we are justified in observing that races, like individuals, have successive periods of progressive growth, of full vigour, and of gradual decay, we may, in the one case as in the other, conclude generally that those which we find to be in the latter stage are the oldest—a conclusion, however, which, in the one case as in the other, must of course be very much modified by the consideration of the numerous constitutional or external circumstances which bring on premature decay and extinction.

A preliminary inquiry, however, is necessary into what constitutes, what are the evidences of, progress, vigour, or decay in a genus, species, or other race of plants, all of which may be entirely independent of the evident vigour or decrepitude of the individuals the race is composed of.

The result of the best-founded opinions on this subject which to my knowledge have been propounded is that a race of plants, be it tribe or genus or species, in its period of full vigour, is widely dispersed, accommodates itself to a great variety of climatological, physical or other external influences, is numerous and varied in subordinate races as well as individuals, these subordinate races, especially those immediately subordinate, not being separated by wide structural gaps, and not having acquired any very marked local characters, but for the most part passing, as it were, into each other, their respective distinctive characters not having yet acquired any marked degree of correlation. On the other hand, a race in a state of decay is represented by subordinate races very distinct in structural characters, of restricted areas, and requiring for their preservation special climatological or other physical conditions, and consequently comparatively few in individuals. Of the former, *Vernonia*, *Eupatorium*, *Aster*, *Senecio*, &c.; of the latter, the first five or six subtribes of Helianthoideæ appear to be good examples among Compositæ.

Old decaying and apparently expiring races may, however, in some of their branches, owing perhaps to a slight change in constitution, habit, or external circumstances, start into new life. Young progressive races, which, like the vigorous young individuals which we see rise from the rotten remains of an aged plane, or olive, or fig-tree, may be rising before our eyes from some branch of an old race which has passed its prime, or whose origin may already be so remote as to be concealed from us. These young progressive races will be very prolific, ready colonizers; and their subordinate races will be generally numerous and so blended together as to defy all positive determination of their limits, and be variously estimated as subgenera, sections, species, subspecies, or varieties. Most of the Cichoriaceous genera may perhaps in this respect be considered as less ancient than most other tribes and still in a state of progress. The six Asteroid types above mentioned and the subtribe Gnaphalieæ of Inuloideæ may perhaps be regarded as races still vigorous, but breaking up into subordinate races of a local character, many of which already give indications of future diminution and extinction, but some of which, as yet of a very low grade, exhibit a great susceptibility of extension and progress.

Some confirmation of the hypothesis that some of the oldest of the primary or tribual and subtribual types of Compositæ are to be sought for in Helianthoideæ, and some of the most recent (of those dating from geological periods antecedent to the present one) among Cichoriaceæ, may perhaps be derived from their structure. The great consolidation and uniform structure of the essential organs of fructification of Compositæ has, as already mentioned, been adduced as evidence of their comparatively recent origin; and this consolidation and uniformity is least marked in Helianthoideæ, most so in Cichoriaceæ. In many Helianthoideæ we find, for instance, the outer bracts of the involucre more foliaceous, the bracts subtending the flowers (or receptacular paleæ) more normally developed and more firmly attached, the calyx-limb (or pappus) less transformed, consisting frequently of persistent teeth or aristæ directly continuous with the ribs of the ovary, and thus showing their really calycine nature, the anthers in some genera less firmly united and perhaps sometimes quite free; and in the female flowers of the Petrobieæ we have an ordinary campanulate regular corolla with the anthers (although small and sterile) well formed on short filaments alternating with the corolla-lobes and far from each other. In Cichoriaceæ the uniformity of the organs of fructification is more absolute than in any other tribe, neither the pistil nor the andrœcium, nor even the corolla affording the slightest structural or sexual distinctive character throughout the eight hundred odd species; the pappus, though more variable, is always amongst those which show the least resemblance to a calyx-limb; and the receptacular paleæ, in the few cases where present, are the least like ordinary bracts.

We may thus, perhaps, be led to conjecture that the primitive form of Compositæ had regular gamopetalous flowers with an inferior ovary, the calyx, corolla, and uniseriate stamens isomerous and probably 5-merous, and the pistil 2-carpellary as in several Rubiaceæ and allied orders, but the ovary internally already reduced to a single cell with a single erect ovule, and the seed exalbuminous, enclosed in an indehiscent pericarp, and containing a straight embryo with an inferior radule—and that it is in the gradual course of subsequent consolidations that the bracts have crowded round the condensed flowers and usurped the functions of the calyx-limb, which has become obliterated or transformed so as to be better adapted to its new duties; the corollas have become contracted, or the outer ones variously developed in forms and colours adapted to assist in the process of cross fertilization (*vexillary functions* of Delpino); the anthers, brought into close contact by the compression of the flowers, have become united and their styles gradually modified so as to assist them in discharging their pollen; and the conversion from hermaphroditism to unisexuality may in various races have variously preceded or followed some or all of these changes, and produced those numerous variations observed in the order.

We might further be led to imagine that several of these changes had taken place at a very early period, previously to the disruption or stoppage of communication between what are now the tropical regions of the globe, that, besides the parent form above supposed, Compositæ existed showing several important modifications, such as, 1st, the regular and uniform tubular development of the corolla, accompanied by more or less of suppression of the inner bracts and of the normal calyx-limb and substitution of a pappus; 2nd, the reduction of the corolla-limb, attended frequently by a sexual dimorphism, and occasional oblique development of the outer female corollas; and, 3rd, perhaps at a later period, the uniform unilateral development of the whole of the corollas, accompanied usually by a suppression of the inner bracts and conversion of the calyx-limb into the pappus. From the first of these modifications would have sprung the Eupatoriaceæ in America, the Vernoniaceæ in the New and the Old World, the Cynaroideæ in the northern and the Mutisiaceæ in the southern hemisphere. From the second modification would have arisen, first, the more slightly altered Helianthoideæ in both the New and the Old World, but chiefly in the former; 2nd, the Helenioideæ in America, and Anthemideæ in the Old World, with the thinly paleaceous modification or total suppression of the inner bracts and calyx-limb; and, 3rd, the cosmopolitan Asteroideæ, Senecionideæ, and the majority of the Inuloideæ, with an almost universal suppression of the inner bracts and conversion of the calyx-limb into a setose pappus. The third general modification, with a very few slight exceptions, has settled down into those Cichoriaceæ whose absolute uniformity has already been observed upon.

Some further remarks bearing upon the above points may be elicited in the investigation of the principle present centres or regions of Compositæ to which I shall now proceed.

C. PRESENT REGIONS OR CHIEF CENTRES OR AREAS OF THE PRINCIPAL RACES OF COMPOSITÆ.

The position of the great centres of the order is evidently in some measure influenced by its prevalent constitution and the consequent effects of climatological and other physical causes upon the gradual migrations of its species. Rarely arborescent and gregarious, still more rarely aquatic, Compositæ are in a great measure excluded from the vast forest-clad lowlands of the Amazon region of America or of east tropical Asia. In the swampy bogs of the northern hemisphere they may not be so rare, but the species are few. Their favourite haunts are treeless or thinly clad mountain-regions, and especially the lower but broken grounds, rocky ridges, or open campos of warm extratropical or subtropical districts. They may be met with, indeed, at the highest altitudes or latitudes which will bear phænogamic vegetation, as well as in the warmest tropical deserts, and a few species as ready colonists are perfectly ubiquitous in the traces of man; but there are tracts of country, such as the Mediterranean region, South Africa, extratropical America, both Mexican and South-Andine, especially abounding in highly differentiated races of very limited areas, others, again, such as the more temperate or mountain districts of the northern hemisphere, where Composite genera and species are as numerous and ill-defined in their subordinate races as wide and vague in their geographical range. These severally constitute the centres of differentiation or areas of preservation, which I shall endeavour to define as Regions of Compositæ. Besides, however, the difficulty of assigning limits to adjoining regions, owing to the mutual interchange of races across their frontiers, even the most distant regions are sometimes connected by races which, owing sometimes to ready colonization, sometimes, perhaps, to antiquity of origin, are now found to occupy very wide or broken and interrupted areas; and a few races may be said to be truly cosmopolitan, affecting no one region more than another. I propose, therefore, to follow up the distinction of regions by a sketch of their connexions and of such evidences as we may trace of the supposed origin of the connecting races. Conjectures, however, as to the original centres or birth-places of all these widely dispersed and interrupted races must, of course, be very hazardous; for if we still hold to the axiom that affinity means consanguinity, we must suppose some preexisting physical conditions and configurations of the globe very different from the present ones, upon the precise nature of which those geologists who admit them at all, seem to be by no means agreed. Into these supposed conditions there would be no advantage in entering now; I only advert to them for the purpose of explaining that, when I speak of ancient connexions between regions now separated by impassable barriers, such as tropical America and Africa, Mexico and the Argentine States, South Africa and Australia, &c., I by no means take it as decided whether that connexion was by contemporaneous continuity of land-elevation or climate now broken off, or by successive connexions with some common land now destroyed, or by means of transport now no longer existing, or by any other facilities afforded by ancient conditions of the globe as yet unknown to us.

In sketching the principal regions of the globe as marked out more or less distinctly by the different races of Compositæ which inhabit them, I shall commence with the primary division into the New and the Old World, and then detail the principal regions in each of these great divisions. I should observe, however, that in using the terms New and Old World rather than those of Western and Eastern continents adopted by Grisebach, it is merely because the former appear to me to be more familiar and more readily understood. Neither term is strictly correct; for it is not intended by the words New and Old to indicate any comparative antiquity of existence (a geological question, upon which I have no right to form any opinion), nor yet the novelty or antiquity of our knowledge of them; for Australia, the most recent of our important discoveries, must in phytogeography be included in the Old World; and the terms Western and Eastern Continents, as applied by inhabitants of Western Europe or Eastern America, must be reversed by the inhabitants of Eastern Asia or Western America. I must observe also that in the Tables given in the following pages the numbers of genera and especially of species must never be taken as absolute; they are at best approximative only, and in some instances may be purely conjectural: they are, however, the best I have been able to arrive at without a careful working-out of the whole of the species known, which would be too many years' labour for me to undertake. Further discoveries would likewise require considerable modifications*; and to those who do not agree with me as to the circumscription of genera and species, the absolute numbers might be very different. I have endeavoured, however, to keep as much as possible to a uniform standard in this respect; and if the same course be adopted by those who multiply or reduce distinctions, the comparative results will probably remain nearly the same.

1. *General Repartition of Compositæ between the New and the Old World.*

In these Tables are included, in the American or New-World division, the West-Indian Islands, and in the Old-World division the Eastern Archipelago and Australia. The Sandwich and South-Sea Islands, the Galapagos, Juan Fernandez, St. Helena, the Atlantic Islands, the Mascarene group, and New Zealand, notwithstanding the American character of the Compositæ of the first groups, and the Old-World connexions of those of the last three, are here omitted; for their endemic races affect very little the general repartition between the two great divisions of the globe, and their geographical peculiarities appear to require consideration under distinct heads. The numbers given, both of genera and species, are intended to apply to natives only, or races which may have been anciently established without the intervention of man, to the exclusion of modern colonists.

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* Two or three new genera and a few new species received since this paper was placed in the printers' hands, would already require some slight changes in a few of the figures of some of the following Tables.

Table 1. *Repartition of Genera in the New and Old Worlds.*

Tribes.	America.		Old World.		Common to the two.	Total.	Add Insular.	Grand Total.
	Endemic.	Total.	Endemic.	Total.				
Vernoniaceæ......	25	29	10	14	4	39	1	40
Eupatoriaceæ ...	30	35	...	5	5*a*	35	...	35
Asteroideæ	39	49	34	44	10*b*	83	8	91
Inuloideæ	16	27	107	118	11*c*	134	8	142
Helianthoideæ ...	107	125	4	22	18*d*	129	9	138
Helenioideæ	57	59	1	3	2*e*	60	...	60
Anthemideæ	3	12	32	41	9*f*	44	1	45
Senecionideæ ...	14	19	19	24	5	38	6	44
Calendulaceæ ...	1	1	7	7	...	8	...	8
Arctotideæ	...	...	17	17	...	17	...	17
Cynaroideæ	...	3	34	37	3	37	...	37
Mutisiaceæ	37	38	14	15	1*g*	52	1	53
Cichoriaceæ	14	24	30	40	10*h*	54	2	56
Total.........	343	421	309	387	78	730	36	766

a 4 almost entirely American.
b 1 almost entirely American, and 1 chiefly Old-World.
c Nearly all chiefly Old-World.
d Most of them chiefly American.
e All almost entirely American.
f 1 chiefly American, 7 chiefly Old-World.
g All chiefly American.
h 1 chiefly American, 7 chiefly Old-World.

Table 2. *Repartition of Species in the New and Old Worlds.*

The numbers in the following Table, especially as to the larger genera, are often but roughly estimated, and may on a close scrutiny require in some instances considerable modification. The common species do not include the weeds of cultivation introduced in modern times from one division to the other.

Tribes.	America.		Old World.		Common to the two.	Total.	Add Insular.	Grand Total.
	Endemic.	Total.	Endemic.	Total.				
Vernoniaceæ......	372	376	152	156	4	528	12	540
Eupatoriaceæ ...	740	743	13	16	3	756	1	757
Asteroideæ	822	830	434	442	8	1264	94	1358
Inuloideæ	146	157	939	950	11	1096	93	1189
Helianthoideæ ...	953	963	67	77	10	1030	47	1077
Helenioideæ	304	304	3	3	...	307	1	308
Anthemideæ	48	63	593	608	15	656	28	684
Senecionideæ ...	497	502	682	687	6	1184	50	1234
Calendulaceæ ...	1	1	102	102	...	103	3	106
Arctotideæ	...	...	237	237	...	237	...	237
Cynaroideæ	41	42	971	972	1	1013	13	1026
Mutisiaceæ	383	383	60	60	...	443	1	444
Cichoriaceæ	156	161	605	610	5	766	43	809
Total.........	4463	4525	4858	4920	63	9383	386	9769

Upon the whole it would appear from the above Tables that Compositæ are not unfairly distributed between the New and the Old World as well as to numbers as to variety of forms, although with a balance in both respects rather in favour of America, the numbers being 4525 species in 421 genera in the New World, against 4920 species in 387 genera in the Old. Further discoveries may also, probably, increase this disparity; for there are many tracts in the great mountain-chain extending from California to Chili, so rich in Compositæ over the whole of its vast extent, which are as yet but little known or wholly unexplored, whilst in the two richest Composite regions in the Old World, the Mediterrrnean and South-African, the Composite forms as yet unknown must be comparatively few. From tropical Africa we may expect rather more, especially as to generic forms; but these may be compensated by fresh discoveries from the interior of Brazil and La Plata. Were the insular floras included in the enumeration, the disparity would again be slightly diminished; for the imperfectly known Mascarene and the well-explored Atlantic Islands would add 18 genera and species to the Old World, whilst the Sandwich and Galapago Islands, now pretty fairly investigated, only add 8 genera and 70 species to the New. St. Helena, New Zealand, and the South-Sea Islands are wholly excluded from these calculations, as not being specially referable to either of the two great divisions.

With regard to the comparative diversity and distinctness of forms in the two divisions, it may be observed that the number of species to a genus is about 10·7 in America, and 12·7 in the Old World, showing in the former more numerous remnants of old types, in the latter a greater luxuriance of flourishing and increasing genera. It will be seen, however, that in each division there are regions remarkably characterized in both respects.

When we come to consider the tribes into which Compositæ have been divided, we at once see a great disparity in their repartition between the two great divisions. Two tribes are almost entirely American, the Eupatoriaceæ and Helenioideæ. In the former 30 genera, including above 200 species, are exclusively American, 3 genera, containing together above 80 species, have each one of their species extending into the Old World. *Eupatorium* itself, of above 400 American species, is represented in the Old World by about 10 species; and the small genus *Adenostyles* alone has an Old-World preponderance, having 2 European and 1 Californian species. Helenioideæ have 57 genera, containing nearly 300 species, exclusively American; one genus, *Flaveria*, of 7 American species, has one of them extending into Australia, another, of four American species, is represented by 1 in South Africa, and a third, *Cadiscus*, is a monotypic South-African plant. Three more tribes have a strong American preponderance, both in their entirety and in their subtribes: Vernoniaceæ have $\frac{29}{39}$ genera and $\frac{376}{528}$ species American, against $\frac{14}{39}$ genera and $\frac{156}{528}$ species in the Old World; Helianthoideæ $\frac{125}{129}$ American genera and $\frac{963}{1030}$ species, against $\frac{22}{129}$ Old-World genera and $\frac{77}{1030}$ species; and Mutisiaceæ $\frac{38}{52}$ American genera and $\frac{383}{443}$ species, against $\frac{15}{52}$ Old-World genera and $\frac{60}{443}$ species. Three more large tribes are more equally distributed: Asteroideæ have $\frac{49}{83}$ New-World genera and $\frac{830}{1264}$ species, against $\frac{44}{83}$ genera and $\frac{442}{1264}$ species in the Old World, showing still an American preponderance, which is slightly reversed in Senecionideæ with $\frac{19}{38}$ genera and $\frac{502}{1184}$ species, against $\frac{24}{38}$ genera and $\frac{687}{1184}$ species in the Old World, and still more so in Cichoriaceæ, with $\frac{24}{54}$ American genera and $\frac{161}{766}$ species, against $\frac{40}{54}$ genera and $\frac{610}{766}$ species in the Old World. The remaining tribes are much more decidedly characteristic of the Old World. Of Inuloideæ the largest, the nine subtribes are all of the Old World, three only of them being represented in America in comparatively few numbers; and the genera are $\frac{118}{134}$ and the species $\frac{950}{1096}$ in the Old World, to $\frac{27}{134}$ and $\frac{157}{1096}$ in the New. Anthemideæ have $\frac{41}{44}$ genera and $\frac{608}{665}$ species in the Old World, to $\frac{12}{44}$ genera and $\frac{62}{656}$ species in the New. Cynaroideæ, with all the 37 genera and $\frac{972}{1013}$ species in the Old World, are represented in America by only $\frac{42}{1013}$ species, belonging to 3 of those genera. Calendulaceæ with 7 of its 8 genera, including 102 species, in the Old World, has a single monotypic American genus; and the 17 genera and 237 species of Arctotideæ are exclusively of the Old World. To sum up in a few words, Compositæ as a whole are not very unequally distributed between the two divisions of the globe; and of the 13 tribes, 12 are common to the two, and only one restricted to one of them. But out of 730 genera 78 only are common to the two, showing already a far greater difference in the character of the Compositæ of the two divisions than can be attributed to any climatological or other physical causes; and the difference is still more striking in the species, of which only 63 out of a total number of nearly 9400 are common to the New and the Old World; and these common ones are chiefly either Alpine or high northern, where the general flora is more continuous, or ready colonizers, although their presence in the two divisions cannot be attributed to recent colonization.

These genera and species common to the two divisions require separate consideration, according as they are tropical, northern, or southern.

Table 3. *Tropical connexion between America and the Old World as indicated by identical or closely allied Genera and Sections without identical Species.*

Genera.	Tropical-American representatives.	Tropical Old-World representatives.
CENTRATHERUM	2 widely spread species, extending southward of the tropics, and one of them reappearing in Australia.	4 Asiatic species, differing perhaps sectionally from the American ones.
Connexions ……	*Oiospermum*, a closely allied monotype, otherwise those of *Vernonia*.	None nearer than *Vernonia*.
VERNONIA.		
Representative sections.	*Hololepis* 2 species.	*V. calycina*, Wall., in Asia, and *V. purpurea*, Sch. Bip., in Africa.
	Lepidaploa about 200 species, a few of which extend beyond the tropics both north and south.	*Gymnanthemum* about 20 species, Asiatic and African, and perhaps a few Asiatic true *Lepidaploæ*.
	Critoniopsis 6 species.	*Strobocalyx* about 20 species, Asiatic and African.
Diverging sections	*Leiboldia*, *Stenocephalus*, *Trianthæa*, and *Eremosis*, all small Columbian or Mexican sections.	*Xipholepis* about 12 species, *Cyanopis* about 20 species, *Tephrodes* about 20 species, all with the majority Asiatic, but also several African species. *Lepidella* 15 species and *Stengelia* 14 species, exclusively African, or nearly so.
Connexions ……	*Piptocarpha* 24 species, *Piptolepis* 8 sp., and *Albertinia*, *Vanillosmopsis*, *Blanchetia*, *Lachnorhiza*, and *Bolanosa*, all monotypic, immediately connected with *Vernonia*; and 17 genera with above 80 species rather more remote.	*Bothriocline* in Africa, *Adenoon* and *Lamprospermum* in Asia, *Pleurocarpæa* in Australia, and *Centauropsis* in Madagascar, all monotypic and immediately connected, and 4 genera with about 9 species rather more remote.
ERIGERON ………	See northern connexions, Table 5.	
CONYZA.		
Identical groups	*Dimorphanthes*, Cass., or genuine *Conyzæ*, represented by *C. chilensis* and allies.	*Dimorphanthes*, represented by *C. ægyptiaca* and allies.
Diverging groups	*Lænnecia* (*C. gnaphalioides* and allies), *C. triplinervia* and allies.	*Marginatæ* (*C. Gouani* and allies), *Fimbrillaria* (*C. ivæfolia* and allies).
Connexions ……	*Erigeron* (*Cænotus*) more northern, and in the tropics *Nidorella* and *Psiadia*, on the one hand, *Laggera*, *Blumea*, *Pluchea*, and smaller ones on the other.	*Erigeron* (*Cænotus*), more northern; and in the tropics *Baccharis* on the one hand, and *Pluchea* and allies on the other.
PLUCHEA.		
Representative species ………	*P. purpurascens* and allies.	*P. tomentosa* and allies.

Genera.	Tropical-American representatives.	Tropical Old-World representatives.
PLUCHEA.		
Diverging groups	*P. Quitoc* and allies, several of them extratropical.	*P. indica*, *Berthelotia*, DC., *P. pinnatifida*, Hook. f., and allies; the species more Asiatic than African, and a few more divergent extratropical Asiatic or Australian species.
Connexions	*Stenachænium* 3 species (Brazil), *Sachsia* 3 species, and *Rhodogeron* 1 species (Cuba), *Tessaria*, 5 species (Western).	*Laggera* 10 species, *Blumea* 55 species, and, in another direction, *Conyza*.
ACHYROCLINE ...	10 species, Brazilian and Western.	6 species, all African.
Connexions	*Gnaphalium* and *Stenocline*.	*Gnaphalium*, *Stenocline*, and others.
GNAPHALIUM ...	See cosmopolitan genera, Table 8.	
STENOCLINE	2 species, Brazilian.	6 species, Mascarene.
Connexions	*Gnaphalium* and *Achyrocline*.	*Helichrysum*, *Gnaphalium*, *Achyrocline*, and others.
GRANGEINEÆ.		
Representative genera	*Egletes* 6 species.	*Grangea* 2 species.
Connexions	*Aphanostephus* 3 species, and, more distant, several north-western Asteroideæ.	*Ceruana* 1 species and several small tropical genera and, more distant, several north-eastern Asteroideæ, and, in another direction, *Cotuleæ*.
MELAMPODIUM...	17 species (tropical or north subtropical).	1 species (Philippines) and a colonist from America.
Connexions	*Acanthospermum* 2 species (tropical), *Lecocarpus* 1 species (Galapagos).	None near.
CHRYSOGONUM ...	1 species, North-American, subtropical.	1 species, tropical Australian, closely representing the North-American one; 2 species Australian and 3 species Asiatic, all tropical and somewhat divergent.
Connexions	*Silphium* 11 species (North-American), *Berlandiera*, *Lindheimera*, and *Engelmannia* 7 species (Mexico and Texas), and *Schizoptera* 1 species (Andine).	None near.
ENHYDRA	3 or 4 species, aquatic and tropical.	1 species, African and Asiatic.
Connexions	*Aphanactis* 2 species, Andine.	None near.
SCLEROCARPUS ...	9 species, tropical or north subtropical.	1 species, African, closely representative of one of the American.
Connexions	*Montanoa* 14 species, Mexican and Andine.	None near.
BLAINVILLEA......	1 species cosectional with the African, and 2 or 3 species sectionally different.	3 or 4 species African, 1 also Asiatic, all cosectional with 1 American.
Connexions	*Wedelia*, *Aspilia*, &c.	*Wedelia* and *Aspilia*.
WEDELIA.		
Sect. *Stemmodon*	4 species, mostly maritime.	1 species, East-Asiatic.
Sect. *Cyathophora*	About 25 species, Brazilian, Andine, &c.	1 species African, 1 species Asiatic.
Sect. *Wollastonia*	None.	About 10 species, Asiatic and Australian.
Connexions	Besides *Blainvillea* and *Aspilia*, *Zexmenia* 20 species, *Oyedæa* 22 species, &c.	None but *Blainvillea* and *Aspilia*.
ASPILIA	About 30 species, 2 or 3 cosectional with 5 African; the others divergent.	8 species, of which 5 African cosectional with 2 or 3 American, 2 African and 1 Mascarene divergent.
Connexions	Besides *Wedelia* and *Blainvillea*, *Zexmenia*, *Oyedæa*, &c., as above.	None but *Wedelia* and *Blainvillea*.
MELANTHERA.		
Sect. *Wurmschmidtia* or *Echinocephalum*.	1 species, Brazil.	1 species, African.
Sect. *Eumelanthera*.	4 species, Brazil, Indian Ocean, &c.	None.
Sect. *Lipotriche*	None.	1 species, African.
Connexions .. .	None very near, but less distant than in Old World.	None near.
SPILANTHES	About 20 species, tropical.	2 or 3 species, Asiatic, Australian, and chiefly East-African; all tropical.
Connexions	None very near, but *Sabazia* nearer than any Old-World.	None.

Genera.	Tropical-American representatives.	Tropical Old-World representatives.
COREOPSIS	3 or 4 Peruvian species near the African, and nearly 40 diverging, chiefly North-American and Mexican.	About 8 species, East-African (*Prestinaria*), near the Peruvian.
Connexions	*Bidens* (*Psilocarpæa*) nearly 40 species, *Cosmos* 10 species, *Dahlia* 4, *Hidalgoa* 2, *Isostigma* 5, *Thelesperma* 4 or 5 species, all tropical or subtropical.	*Bidens* (*Psilocarpæa*) 2 species (colonists?), *Glossogyne* 5 species (East-Asiatic and Australian), *Guizotia* 3, and *Microlecane* 1 (African).
CHRYSANTHELLUM.	1 species tropical-American, 1 Galapagos.	1 species, African and Asiatic, probably the same as the American.
Connexions	*Heterospermum* 1 species.	*Glossocardia* 1 species, Asiatic.

A first rapid glance over the above Table shows the general American character of the whole. For the most part the African and Asiatic species sections or genera are few and disconnected, the corresponding American ones numerous and closely connected on all sides with American allies. And yet the endemic Old-World races from species to genera are too numerous and varied to admit of the supposition that they can ever have migrated from America and become extinct in their birth-place. It would seem rather that whatever may have been the cause of the parent *Wedeliæ*, *Sclerocarpi*, *Melantheræ*, &c. having once been established both in Africa and in America, or in some land at one or different times in connexion with the two continents, they had by long isolation become more and more differentiated in the two—that in America they have as races prospered and multiplied in every direction and possibly retained many of their very early forms; whilst in the Old World they have found less genial circumstances, they have for the most part dwindled away, a far greater proportion than in America have become extinct, and the few local representatives we now see are probably in the course of extinction. And this will, I believe, be found to be more particularly the case with the African races. Here, more perhaps than in any other part of the globe, in Compositæ as in so many other orders, we may fancy we see the scattered remains of ancient races dwindling down to their last representatives.

It is not so, however, with a few of the races included in the above Table, especially some of those which have rather more of an Asiatic than an African character. The sections *Tephrodes*, *Cyanopis*, and *Gymnanthemum* of *Vernonia*, the section *Wollastonia* of *Wedelia*, the genera *Ethulia* and *Chrysanthellum* may be flourishing and increasing races, which have already been much differentiated in the Old World and are likely to become more so; the two last-named, as well as *Vernonia* (*Tephrodes*) *conyzoides*, are ready colonizers, although neither the *Ethulia* nor the *V. conyzoides* has as yet appeared in America. The African *Vernoniæ* (section *Stengelia*) and *Coreopsides* (section *Prestinaria*) and the eastern *Chrysogona* and *Glossogynes*, although showing each several species, have probably already seen their best days.

Table 4. *Tropical connexion between the New and the Old World as indicated by identical Species.*

This Table includes the species of those genera only which have an essentially tropical character, although some may, perhaps, extend northwards or southwards beyond the tropics, excluding the common species as well of the cosmopolitan genera enumerated in Table 8 as of the northern or southern connecting genera contained in Tables 5, 6, and 7, which may also be found within the tropics, as in both cases the original connexion or communication was probably extratropical.

Species.	Area.	Congeners.	Connexions.
Sparganophorus Vaillantii	East tropical America, West tropical Africa, (semiaquatic).	None.	(*Pacourina*) American.
Elephantopus scaber	America, Asia, and Africa, tropical and subtropical.	8 American and 1 African species.	None immediate, but the nearest American.
Adenostemma viscosum ...	Cosmopolitan, tropical and subtropical (ready colonist).	4 American species.	All American.
Ageratum conyzoides	Cosmopolitan, tropical and subtropical (ready colonist).	15 American species.	All American.
Mikania scandens	America, Asia, and Africa, tropical and subtropical.	60 American species.	All American.
Epaltes brasiliensis	East tropical America, West tropical Africa (semiaquatic ?).	1 American cosectional species, 6 African, Asiatic, or Australian, tropical or subtropical, forming separate sections.	Chiefly African.
Ambrosia maritima	America, Asia, Africa, and South Europe, tropical and subtropical (maritime).	11 American species.	All American.
Xanthium strumarium ...	America, Asia, Africa, and South Europe, tropical and subtropical(ready colonist).	2 or 3 American species (all ready colonists).	All American.
Siegesbeckia orientalis......	America, Asia, and Africa, tropical and subtropical (ready colonist).	1 American species.	All American.
Eclipta alba, *Hassk.* (E. erecta, E. prostrata, &c.).	America, Asia, Africa, and Australia, tropical and subtropical (ready colonist).	1 cosectional species, East - Asiatic and Australian, 1 or 2 American, forming a separate section.	All American.

Species.	Area.	Congeners.	Connexions.
Bidens pilosa and B. bipinnata.	Cosmopolitan, tropical and subtropical (ready colonists).	About 40 cosectional species, all tropical American; a distinct section, amphigeous and extratropical.	Chiefly American, with a few African.
Synedrella nodiflora.........	America, Asia, and Africa, tropical (ready colonist).	1 tropical-American species.	Chiefly American, with a few African, besides the following.
Chrysanthellum..............	America, Asia, and Africa, tropical.	1 tropical-American (Galapagian).	1 tropical-Asiatic monotype (*Glossocardia*) and 1 tropical-American (*Heterospermum*), the further ones chiefly American.
Enhydra (several names, probably one species).	America, Asia, Africa, and Australia, tropical (semiaquatic).	2 or 3 tropical-American species.	None immediate; the nearest American.
Cotula coronopifolia.........	Europe, South Africa, Australia, extratropical South America.	About 35 Old-World species, chiefly South-African, 2 South-American.	A few small allied genera chiefly South-African, Australian, New Zealand, and extratropical or Andine, 1 American.
Centipeda orbicularis (Myriogyne minuta and M. elatinoides).	South Africa, Australia, New Zealand, extratropical South America.	1 Australian (and 1 African?) species.	Same as *Cotula*.

We have here, as in the first list, a marked American preponderance; for, with the exception of *Chrysanthellum*, *Cotula*, and *Centipeda*, the connexions are exclusively, or almost exclusively, American. It is possible, indeed, that the *Ageratum*, the *Siegesbeckia*, the two *Bidens*, and even the *Synedrella* may be of comparatively modern introduction, and may belong therefore rather to the class of species of which the interchange between various regions is now going on. The *Ambrosia* also as a maritime plant may have been brought over at any time. The *Sparganophorus*, the *Enhydra*, and perhaps the *Epaltes* belong to the class of semiaquatic plants whose wide diffusion and ready dispersion to great distances have been frequently observed, although, perhaps, not yet satisfactorily accounted for. *Xanthium spinosum*, long known in the Old World, but which has only very recently taken possession of Australia, is here omitted, as being believed by many to be only a modern colonist in the Old World. But the *Elephantopus*, *Adenostemma*, *Mikania*, *Eclipta*, *Xanthium strumarium*, and *Chrysanthellum*, besides the above-mentioned *Enhydra* and *Epaltes*, give strong presumptive evidence of a prehistoric establishment in the Old World, not, perhaps, ancient enough to have settled down into distinct species, but having most of them already produced more or less marked varieties, which may be considered as incipient species, to be further differentiated should any change in physical conditions tend to isolate them. It will be observed that these American species supposed to be prehistorically established in the Old World are in their present distribution mostly rather of an Asiatic and chiefly Eastern than of an African character; and this, taken in conjunction with the *Wedelia* (*Stemmodon*), *Melampodium*, and some other E.-Asiatic types of the first list, and with many instances that might be taken from other orders, might induce a belief that, as far as plants are concerned, the connexion or communication (whatever may have been its nature) between America and east tropical Asia was of an antiquity less remote than that between tropical America and Africa.

Table 5. *Extratropical Northern connexion between America and the Old World as indicated by identical or nearly allied Species, Sections, or Genera.*

This Table includes all the genera whose connecting sections or species are northern and extratropical, although some of them may extend into the tropics in one or both divisions of the globe, but generally with a greater divergence in character as well as in geographical position than in the north. Some may reappear in the south, and even may there cross again from the New to the Old World (e. g. *Centaurea*), and may therefore be repeated in Table 7, although the primary connexion was probably northern.

Genera.	American races.	Common races.	Old-World races.
EUPATORIUM...	About 24 North-American species, but about 400 more dispersed over Central and South America.	None; but some of the North-American ones nearer to the Old-World forms than to the mass of American ones.	7 or 8 Asiatic species, 2 or 3 extending westward to the Mediterranean region and Europe generally, and 1 in east tropical Africa; all closely allied to each other and to some North-American forms.
Connexions ...	Several American genera	....	None very near.
ADENOSTYLES	1 Californian species.	None; but the American species nearer to one of the European than they are to each other.	2 European species.
Connexions ...	None very near; but *Brickellia* perhaps nearer than *Eupatorium*.	....	None nearer than *Eupatorium*, a more remote one with some Senecionideæ.
SOLIDAGO	Nearly 80 species, chiefly North-American; a few West-American or southern extratropical.	*S. virga-aurea*, L.	None besides the common one and a few colonists.
Connexions ...	Several North or West American or south extratropical genera.	....	None in the north; a few extratropical South-African genera.

Genera.	American races.	Common races.	Old-World races.
BELLIS	2 North-American (Southern States) species.	No common species.	6 Mediterranean-region species.
Connexions	None very near.	....	*Bellium* in the Mediterranean region, *Brachycome* and *Steirodiscus* in Australia and South Africa.
BOLTONIA	7 North-American or Mexican species.	No common species.	5 East-Asiatic species, not strictly cosectional with the American.
Connexions	*Townsendia* and others, connecting with *Aster*.	....	*Heteropappus* and others, connecting with *Aster*.
ASTER	Nearly 100 species, belonging to the common sections in North America and the Mexican region. Several southern species of divergent sections.	4 common sections—*Alpigenia, Euaster, Orthomeris*, and *Galatella*; 1 species, *A.* (*Alpigenia*) *alpinus*.	About 40 species, belonging to the common sections; all extratropical, chiefly Asiatic, few European, and 1 South-east African.
Connexions	Numerous extratropical or Alpine, both north and south.	....	Few north, but numerous south; all extratropical.
ERIGERON	Nearly 40 species, belonging to the common section in North or West America. Several diverging sections in North and South America.	*E. alpinus*, L.; *E. uniflorus*, L.; *E. glabratus*, Hoppe (*E. acris*, L.?); all in section *Trimorphæa*, besides colonists in other sections.	About 8 or 9 species, belonging to the common section, chiefly northern. Several diverging sections, northern, tropical, or southern.
Connexions	Extratropical; *Aster* and allies tropical. See *Conyza*, Table 3.	....	Extratropical; *Aster* and allies tropical. See *Conyza*, Table 3.
BRACHYACTIS.	None besides the common species.	*B. ciliata*, Ledeb.	6 Asiatic species.
Connexions	*Erigeron* and *Conyza*, both very close.	....	*Erigeron* and *Conyza*, both very close.
FILAGO group.	*Filago* 1 Californian species cosectional with the Old-World species, the common species in Chili; *Evax* 1 species, *Micropus* 4 species, of divergent sections.	*Filago gallica*, L. (colonist?); the Californian *Filago* closely representative.	*Filago* 7 species, *Evax* 9, and *Micropus* 3 species, all Mediterranean or Europæo-Asiatic.
Connexions	*Psilocarpus, Diaperia*, and *Micropsis* (12 species), all very close and North-American, chiefly western. *Gnaphalium* more remote.	....	*Ifloga* 8 species, Mediterranean and South-African, nearly connected. *Gnaphalium* more remote.
GNAPHALIUM.	Numerous species, northern and southern, chiefly extratropical or mountain, but also tropical.	*G. luteo-album*, L.; *G. purpureum*, L.; *G. uliginosum*, L.; *G. sylvaticum*, L.; *G. supinum*, Vill.	Numerous species, north and south, chiefly extratropical or mountain, but also tropical.
Connexions	The following three genera and a few others, chiefly South-American, and not numerous in species.	....	*Helichrysum*, with several northern and very numerous southern species, and several other southern genera, with numerous species, very close. The following three northern genera and several others, chiefly southern, rather more distant.
ANTENNARIA	8 North-American species, including the 3 common species and 1 southern extratropical.	*A. dioica*, Gærtn.; *A. alpina*, Gærtn.; *A. carpathica*, Br.	5 species, Europæo-Asiatic, including the 3 common species.
Connexions	The two following genera and, through them, *Gnaphalium*.	....	The two following genera and, through them, *Gnaphalium*.

Genera.	American races.	Common races.	Old-World races.
LEONTOPODIUM	2 Andine species.	No common species.	3 species, Europæo-Asiatic.
Connexions ...	*Antennaria* and *Gnaphalium*.	....	*Antennaria* and *Gnaphalium*.
ANAPHALIS......	None besides the common species.	*A. margaritacea* (*Gnaphalium*, Linn.).	About 24 species, all Asiatic, northern or tropical, chiefly mountainous, besides the common species, which is North-east Asiatic and perhaps European.
Connexions ...	*Gnaphalium*.	....	*Gnaphalium*.
ADENOCAULON.	1 North-west American, 2 Chilian species.	No common species; but the North-west American and the Asiatic species closely representative.	1 or 2 species, Japan and Himalaya.
Connexions ...	Millerieæ generally, but none very close.	....	None.
ACHILLEA	3 North-American species, including the common species.	*A. millefolium*, Linn.	About 80 Europæo-Asiatic and Mediterranean species.
Connexions ...	None.	....	*Santolina*, *Anthemis*, &c., numerous species.
CHRYSANTHEMUM.	None besides the common species.	*C. leucanthemum*, L. (2 or 3 varieties or species).	About 100 species, Europæo-Asiatic and a few South-African; several cosectional, the others divergent.
Connexions ...	None besides *Matricaria*.	....	*Matricaria* and several other Anthemideæ.
MATRICARIA ...	None besides the common species.	*M. inodora*, L., and *M. discoidea*, DC.	About 20 species, above half Mediterranean and Europæo-Asiatic, the remainder South-African.
Connexions ...	None besides *Chrysanthemum*.	....	*Chrysanthemum*, on the one hand, and, through *Nananthea*, *Cotula* on the other, numerous species.
TANACETUM ...	5 North-American species.	No common species.	About 30 species, Mediterranean and Europæo-Asiatic, but chiefly Asiatic.
Connexions ...	*Artemisia* only.	....	On the one hand *Artemisia*, through *Crossostephium*, on the other several South-African genera.
ARTEMISIA	About 30 N.-American species, including the 9 common species, and 2 or 3 south extratropical or Andine species.	*A. borealis*, Pall.; *A. dracunculoides*, Pursh? (= *A. dracunculus*?); *A. vulgaris*, L.; *A. glomerata*, Ledeb.; *A. globularia*, Cham.; *A. arctica*, Less.; *A. frigida*, Willd.; *A. absinthium*?, L.	About 120 species, chiefly Europæo-Asiatic and Mediterranean, and most abundant in Asia. A few South-African or tropical species.
Connexions ...	*Tanacetum* and a distant one with Ambrosieæ.	....	*Tanacetum*, through *Crossostephium*.
PETASITES	4 North-American species.	No common species.	8 Europæo-Asiatic species.
Connexions ...	None very near; *Luina* 1 species, and *Peucephyllum* 1 species, both North-west American, and rather distant.	....	*Tussilago*, *Homogyne*, and *Cremanthodium*, together 9 species, all very near and Europæo-Asiatic.
ARNICA..........	9 North-American species, including the common species.	*A. angustifolia*, Vahl? (*A. montana*, var.?).	The common species in North Asia, and the typical *A. montana*, Europe and Asia.

Genera.	American races.	Common races.	Old-World races.
ARNICA.			
Connexions ...	None close; *Crocidium*, 1 species, rather distant.	....	*Doronicum*, 10 species, Mediterranean and Europæo-Asiatic.
SENECIO	Very numerous species, north and south.	*S. palustris*, Hook.; *S. frigidus*, Less.; *S. resedifolius*, L.; *S. pseudo-arnica*, Less.	Very numerous species, north and south.
Connexions ...	*Culcitium*, *Gynoxys*, and other divergent genera.	....	*Notonia*, *Emilia*, *Gynura*, *Cineraria*, and other divergent genera.
WERNERIA	16 Andine species.	No common species.	1 Himalayan, 1 Abyssinian species.
Connexions ...	*Senecio*, very near.	....	*Senecio*, very near.
CNICUS...........	35 North-American and Mexican species.	No common species besides colonists.	About 130 species, Europæo-Asiatic, Mediterranean, with a few tropical species.
Connexions ...	None very near; the two following genera the only cotribuals.	....	*Carduus*, 60 species, very close, and many others slightly divergent.
SAUSSUREA......	None besides the common species.	*S. alpina*, DC.	About 60 species, chiefly Asiatic, a few European.
Connexions ...	None near.	....	*Serratula*, *Jurinea*, and several others, numerous in species.
CENTAUREA ...	1 North-American, 5 Chilian species.	No common species, but the American almost cosectional with a few Mediterranean, tropical African, and the Australian species.	Above 300 species, Europæo-Asiatic and Mediterranean, 6 tropical and 1 Australian species.
HYOSERIS group	*Microseris*, *Krigia*, and *Phalacroseris*, 16 species, chiefly North-west American.	No common genera.	*Hyoseris* and *Arnoseris*, 5 Mediterranean and Europæo-Asiatic species.
Connexions ...	Cichoriaceæ generally.	....	Cichoriaceæ generally.
LAPSANA group.	*Apogon* 1 North-American species.	No common genera.	*Lapsana*, 4 species, 1 North-east Asiatic (the nearest to *Apogon*), the others Europæo-Asiatic and Mediterranean.
Connexions ...	Cichoriaceæ generally.	....	Cichoriaceæ generally.
CREPIS	6 species, North-American; all *Eucrepis*, including the 2 common species.	*C. nana*, Richards.; *C. biennis*, Linn.	About 90 species, Europæo-Asiatic and Mediterranean, 1 South-African, and 1 Australian. *Eucrepis* and several diverging sections.
Connexions ...	None nearer than *Hieracium*.	....	*Phæcasium* and a few other small nearly allied genera. *Hieracium* rather more distant.
PICRIS	None besides the common species.	*P. hieracioides*, Linn.	About 28 species, Europæo-Asiatic and Mediterranean, including the common species, which is almost cosmopolitan.
Connexions ...	None nearer than *Crepis*.	....	None nearer than *Crepis*.
HIERACIUM	About 25 northern and 15 southern species, belonging to the common sections; mostly extratropical or mountain, and chiefly *Stenotheca*.	Sections *Archhieracium* and *Stenotheca*. *H. murorum*, Linn.?	Above 100 species, many *Archhieracium*, few *Stenotheca* besides *Pilosella*, which is not American.
Connexions ...	*Malacothrix*, 9 species, *Anisocoma*, 1 species; neither very close.	....	*Andryala*, 6 Mediterranean species, very close.

Genera.	American races.	Common races.	Old-World races.
HYPOCHŒRIS...	About 25 species, South American, chiefly Andine or extratropical.	Sections *Achyrophorus* and *Serioloides*, but no common species except *H. glabra*, L., and *H. radicata*, L., probably colonists in most stations.	About 10 species, Mediterranean and Europæo-Asiatic, including the common sections and small endemic sections.
Connexions ...	*Leontodon* the nearest.		*Leontodon* the nearest.
LEONTODON ...	Section *Apargidium*, 1 species.	No common section or species.	Near 40 species of sections distinct from the American.
Connexions ...	*Troximon*, 16 species North-American, with 1 South-American species, besides *Hypochæris* and *Taraxacum*.		None nearer than *Hypochœris* and *Taraxacum*.
TARAXACUM ...	None besides the common species.	*T. officinale* (often colonist?).	About 5 species besides the common one, Europæo-Asiatic and Mediterranean, the common one cosmopolitan.
Connexions ...	*Leontodon*.		*Leontodon* and *Chondrilla*.
LACTUCA.........	8 species North-American, of the two common sections, and 1 or 2 tropical-American.	Sections *Cicerbita* and *Mulgedium*, no common species.	About 60 species, chiefly Europæo-Asiatic and Mediterranean; the common sections chiefly Europæo-Asiatic, the Mediterranean often divergent, and a few tropical species.
Connexions ...	None nearer than *Prenanthes*.		*Chondrilla* and some small genera, Europæo-Asiatic and Mediterranean. *Prenanthes* rather further.
PRENANTHES ...	10 North-American species of a distinct (?) section.	No common section or species.	About 6 Europæo-Asiatic and Mediterranean species, near to but distinct from the American section.
Connexions ...	*Lactuca* and *Sonchus*, not very near.		*Lactuca* and *Sonchus*, not very near.
SONCHUS.........	None besides the common species.	*S. oleraceus*, L. (incl. *S. asper*, Hoffm.), frequent colonist.	About 24 species, Europæo-Asiatic and Mediterranean, including the common (cosmopolitan) species.
Connexions ...	None nearer than *Prenanthes*.		*Microrhynchus*, *Heterachæna*, and *Picridium* about 27 species, chiefly Mediterranean. *Prenanthes* more distant.
SCORZONERA group.	*Pinaropappus*, *Lygodesmia*, *Scorzonella*, and *Stephanomeria*, about 20 North-west American, and *Picrosia* 1 South-American species.	No common genera.	*Tragopogon*, *Urospermum*, *Scorzonera*, *Epilasia*, and *Tourneuxia*, nearly 140 species, Europæo-Asiatic and Mediterranean.
Connexions ...	Cichoriaceæ generally.		Cichoriaceæ generally.

The above Table would appear to give ample evidence of a (geologically) modern interchange of Composite vegetation. Thirty of the thirty-eight generic groups have a general range over North-eastern Asia and Northern America, and may therefore be considered as comparatively continuous. They include about four-and-twenty species absolutely identical in the two divisions;

and many others are closely represented in both, indicating a common origin in one of the two; but whether the flora, or, indeed, any individual race, has travelled eastward or westward it would be difficult to decide; the evidence is different as to different genera, and in almost any case may be explained both ways. *Eupatorium*, *Solidago*, and *Aster* (*Euaster*) are very large American genera, numerous in species throughout North America, diminishing, however, in numbers in the north-west, reduced to very few in East Asia, and dwindling down to a single one or two in West Europe. Most of the Anthemideæ and Cichoriaceæ, numerous in the Mediterranean region and West Asia, as well as *Tanacetum* and *Artemisia*, whose chief seat is, perhaps, Central Asia, all diminish eastwards, and are reduced to very few in North America, chiefly at high latitudes or along mountain-ranges. The *primâ facie* conclusion would be that the former, of American origin, had struggled to extend themselves westward with less and less of success as the distance from home increased, and the latter, of Old-World origin, had met with a similar fate in their progress eastwards. But, on the other hand, it might also be argued (perhaps, however, with less plausibility) that both had once ranged over the whole region in a small number of specific races, but that, the one set finding the west and the other the east more congenial, the circumstances more favourable to their preservation and development, they had in course of time multiplied in the one division not only in individuals but in differentiated races, whilst in the other they had more or less succumbed to adverse influences and gradually become extinct, barring the few representatives still capable of accommodating themselves to the circumstances among which they are placed. Eight or ten, however, of the generic groups enumerated have no such apparent continuity; their widely disconnected areas seem to imply an ancient very wide range, early broken up through the greater part of its extent, leaving here and there a few isolated remnants which have lasted long enough to produce endemic races at the opposite extremes, the common parent races having become extinct in their typical forms. *Adenostyles*, with one species in California and two in Central Europe, Filagineæ (*Evax*, *Filago*, and *Micropus*), with seven North-west-American and nineteen Mediterranean species, *Bellis*, with two in the southern states of North America, six in the Mediterranean region, *Werneria*, with one Abyssinian, one Himalayan, and about sixteen Andine species, *Centaurea*, of a type unknown in Central or Northern Asia, with one species in the United States, four or five in Chili, one in the mountains of South-east Australia, three or four in the Mediterranean region, and two in Abyssinia, would, under the theory that affinity indicates consanguinity, imply an immense and luxuriant dispersion in early times, such as we now see in *Sonchus*, *Picris*, or *Hypochœris*, followed by an almost equally general destruction from causes as to which it seems at present vain to offer any conjecture. *Adenocaulon*, *Leontopodium*, *Cnicus*, and some sections of *Aster*, *Hyoseris*, &c. show a dispersion somewhat intermediate in character, less disjointed than the second series of genera, but of an area more broken than the first series.

Extratropical southern connexion between America and the Old World, as indicated by identical or nearly representative Species, Sections, Genera, or marked groups of Genera.

These connexions are twofold—first, between South America and South Africa, and, secondly, between South America and Australia. The two are quite distinct from each other, the former very few and remote, the latter rather marked, and all quite independent of the connexions between South Africa and Australia enumerated below at the end of the notes on Old-World distribution. Taking, first, the South-African races, we have

Table 6. *Connexions between South America and South Africa.*
(There are no species common to the two.)

Genera.	Exopical South-American representatives.	South-African representatives.
ASTER type	*Sommerfeldtia*, 1 species (South-east America).	*Felicia*, 45 species.
Connexions	*Aster* (North and West America), nearer than *Diplostephium* (Andes), or *Chiliotrichium* (extratropical South America).	*Aster* (Europe, North Asia, and 1 South-east African species), nearer than *Olearia* (Australia).
HOMOCHROMOUS ASTEROIDEÆ	*Hysterionica*, *Nardophyllum*, and *Lepidophyllum*, about 20 species.	*Pteronia*, *Fresenia*, and *Homochroma*, about 55 species.
Connexions	*Solidago*, *Haplopappus*, &c., above 150 North- and West-American species.	None except the Mascarene *Rochonia* and *Glycideras*, 3 or 4 species.
JAUMEA	2 South-American species, 1 Mexican and 1 Californian species.	1 south-east tropical species (*Hypericophyllum*), nearer to the Mexican (*Espejoa*) than to the South-east American (*Jaumea*) and North-west American species (*Coinogyne*).
Connexions	*Venegasia* and *Olivæa*, Mexican monotypes, and, through them, the whole tribe of Helenioideæ.	None except the remote one with the monotypic *Cadiscus*.
FLAVERIEÆ	*Flaveria*, 8 species, South and West America; the nearest genus to *Cadiscus*, but not closely representative.	*Cadiscus*, 1 species.

Genera.	Extratropical South-American representatives.	South-African representatives.
FLAVERIEÆ.		
Connexions	*Tagetineæ*, near 100 species, not very closely allied.	None.
COTULEÆ...........	*Plagiocheilus*, 6 species, chiefly south-western.	*Cotula* and *Cenia*, about 30 species.
Connexions	*Soliva* and *Abrotanella*, about 5 species, further ones very remote.	Gradual with the whole tribe of Anthemideæ.
CALENDULACEÆ	*Eriachænium*, 1 species, Antarctic America.	*Oligocarpus*?, 3 species.
Connexions	None.	7 genera of Calendulaceæ, including 112 species, and, through them, South-African Senecionideæ on the one hand, and Arctotideæ on the other.
GERBERA type ...	*Chaptalia*, 18 species, southern and tropical.	*Gerbera*, 20 species, South- and West-African, with a few Asiatic.
Connexions	*Trichocline*, 20 species, southern and tropical, and, through them, with several other Mutisiaceæ.	None very near; a marked gap between *Gerbera* and the other African and Asiatic Mutisiaceæ.

Out of the above list *Felicia* and *Sommerfeldtia*, *Pteronia* and allies with *Hysterionica* and allies, *Plagiocheilus* and *Cotula*, *Chaptalia* and *Gerbera*, may be regarded as the results of the partial break-up of four great cosmopolitan or very widely spread southern or extratropical races—the *Aster* type, the *Solidago* type, the *Cotula* type, and the *Gerbera* type. But *Jaumea*, section *Hypericophyllum*, and *Cadiscus* are very singular in their geographical position. Both monotypic, they are the unique representatives in the Old World of the great American tribe of Helenioideæ. One of them, *Hypericophyllum*, is so near in structure to the South-American *Jaumea*, to the Californian *Coinogyne*, and especially to the Mexican *Espejoa*, that I have ventured to unite them generically—to which course I fear I may meet with many objectors, chiefly on account of the very great geographical discrepancy. But I may observe that a similar distribution, although rare, has been noted in other parts of the vegetable kingdom, as, for instance, in the two Scrophularineous genera *Melasma* and *Alectra*, which have each a South-African, a South-American, and a Mexican species. *Cadiscus* is less closely allied to *Flaveria* and *Porophyllum*, but is much nearer to them than to any Old-World forms. As a *pendant* to these two cases we have the monotypic *Eriachænium*, from the southern extremity of South America, the sole American representative of the eminently African tribe of Calendulaceæ, whose connexions with other tribes are also exclusively of the Old World.

Table 7. *Connexions between South America and Australia.*

Genera.	Extratropical South-American representatives.	Australian representatives.
CENTRATHERUM	2 South-American species.	1 species identical with one of the American ones.
Connexions	*Oiospermum*, 1 species, and very numerous Vernoniaceæ.	*Pleurocarpæa*, 1 species, not very near, and no other Vernoniaceæ.
ASTER type	*Chiliotrichium*, 3 species, quite southern.	*Olearia* about 80 species, Australia and New Zealand.
Connexions	*Diplostephium* 18 Andine species, and, through them, the northern and western *Asters*.	None nearer than *Erigeron*.
ERIGERON type (for *Erigeron* itself see Table 8)	*Vittadinia*, 1 species, *Podocoma*, 5 species.	*Vittadinia*, 4 species, *Podocoma*, 1 species (none identical).
Connexions	*Erigeron* about 14 species, and, through them, with *Sommerfeldtia* and the northern and western *Asters*.	*Erigeron*, 4 species, but no other nearer than *Olearia*.
PTEROCAULON ...	6 species, mostly tropical or even northern.	7 species, only 2 Australian, the others North-Caledonian, and 1 South-Asiatic.
Connexions	Tropical, with *Epaltes*, *Pluchea*, and allies.	*Epaltes*, 2 species, but no others near.
ECLIPTA (see also Table 4).........	2 Chilian species (besides the cosmopolitan one).	1 Australian and South-east Asiatic species (besides the cosmopolitan one).
Connexions	*Leptocarpha*, 1 Chilian species, and epappose Verbesineæ generally.	None near, and very few more distant Verbesineæ.
FLAVERIA	7 American species, chiefly southern and western.	1 species closely representative of the commonest American one.
Connexions	*Sartwellia*, 1 North-west American species, and more distant with the Tagetineæ, all American.	None.
COTULEÆ	*Plagiocheilus*, 6 South-American species.	*Cotula*, section *Leptinella*, 3 Australian species and of various sections, 11 New-Zealand and Australian species.
	Soliva, 4 South-American extratropical and tropical species.	*Soliva*, 1 species, identical with one of the South-American.
	Abrotanella, 1 Antarctic American species.	*Abrotanella*, 3 Australian and 4 New-Zealand species.
Connexions	None nearer than *Artemisia*.	None.
ERECHTHITES ...	7 tropical or western species, 1 extending to North America.	6 Australian and New-Zealand species, 1 (colonist?) in South Asia.
Connexions	The cosmopolitan *Senecio*.	The cosmopolitan *Senecio*.
CENTAUREA	5 Chilian species.	1 Australian species.
Connexions	None except 1 North-American species; the numerous other species and allied genera all northern Old World.	None.
TRICHOCLINE......	About 20 American, chiefly southern, species.	1 Australian species.
Connexions	*Chaptalia*, 18 American species, and, through them, many American Mutisiaceæ.	None.
MICROSERIS	1 American extratropical and several North-west American species.	1 Australian and New-Zealand species.
Connexions	None southern nearer than *Hypochæris*; in the north *Krigia*, and, through it, other Cichoriaceæ.	None except colonists.

The amphigeous races enumerated in the above Table are of a very mixed geographical character. The *Vittadinia*, *Podocoma*, *Pterocaulon*, *Eclipta*, and *Erechthites* are subtropical; and although they have no representative, except presumed colonists, in tropical Africa and Asia, and therefore did not find a place in Table 3, yet their geographical connexions and presumable origin may be assimilated to the few genera of that Table whose Asiatic character approaches or even exceeds the American. The single species of *Centratherum*, *Flaveria*, *Soliva*, and *Trichocline*, identical with, or closely representative of, corresponding American species of essentially American genera, suggest doubts whether they are ancient (or even modern?) colonists from America or really remains of an ancient common flora. The *Chiliotrichium* and *Olearia*, the *Plagiocheilus* and *Leptinella*, the *Abrotanella* and the *Microseris*, and even the *Centaurea* form part of that general Antarctic flora which in so many orders shows a striking connexion between Australia (especially South-east Australia and Tasmania), New Zealand, and the southern extremity of South America, the *Microseris* and *Centaurea* showing in Australia the extreme end of an area extending from the northern extratropical Old World over North America down the western backbone of the New World to the extreme south, and thence to Australasia. Australia, therefore, in regard to America, would appear once to have had in the south an antarctic or mountain connexion or communication sufficient for the interchange of races, to have received in the north in ancient times, as part of the Indo-Australian region, a few tropical or subtropical American races, and in ancient, as in recent, times to have readily admitted and favoured the spread of colonists from America as well as from South Africa, and more recently from Europe.

Table 8. *Endemic Species of cosmopolitan or very widely spread Genera.*

I include under this head those genera or groups of genera which have endemic representatives both in the New and the Old World, and both in the northern and in the southern hemisphere. The numbers given are necessarily very vaguely estimated for the northern and tropical regions, and must be taken rather as relative than as absolute; those for South Africa and Australia, founded on already worked-up floras, will be found more accurate. Such cosmopolitan or widely spread species as *Gnaphalium luteoalbum*, *Erigeron linifolium*, *Pluchea indica*, *Cotula coronopifolia*, &c. are omitted, as having nearly the area of the genus, at least in their own primary division of the globe. *Senecio* has no such cosmopolitan species.

Genera and groups of genera.	Endemic Species in						
	North America, including Mexico.	Tropical South America.	Extratropical South America.	Europe and extratropical Asia.	Tropical Asia and Africa.	South Africa.	Australia.
Aster type	120	28	11	50	2	53	63
Erigeron	45	35	18	8	1	1	3
Conyza	3	4	3	2	20	8	2
Pluchea	7	5	...	1	10	...	4
Gnaphalium	18	20	18	10	12	8	6
Cotula	1	...	...	6	1	20	8
Senecio	105	265	100	160	80	190	28
Gerbera type	1	26	11	1	4	15	1
Hieracium	26	10	4	110	...	2	...

Of the above genera, *Conyza*, *Pluchea*, and, in a less degree, *Gerbera* have a rather tropical character; the others are more prevalent in temperate or mountain-regions. All, except *Cotula*, are endowed with means of dispersion which we should, *primâ facie*, qualify as ready, the pappus spreading and light in proportion to the achene; but the ready colonizers (one, two, or three to a genus) belong to three or four only (*Erigeron*, *Conyza*, *Gnaphalium*, and perhaps *Pluchea*) of the eight pappose genera, or to *Cotula*, which has no pappus. *Senecio* is remarkable for the enormous number of locally restricted species, no one of them common to any two of the above regions, and not yet satisfactorily distributed into sections at once geographical and structural. Its only colonizer, *S. vulgaris*, is not classed here amongst the ready colonists; for, as far as I can learn, although carried out into some distant lands with cultivation, it does not, like *Erigeron canadense* and others, establish itself over the country in waste and uncultivated localities. The sections or divisions of *Gnaphalium*, *Erigeron*, and *Conyza* are more marked than those of *Senecio*; but the principal ones are not geographical. *Aster*, *Cotula*, and *Gerbera* have established subordinate races, geographical as well as structural, sufficiently distinct for us to have adopted them as genera.

To the above genera might be added a few of very wide distribution, which, from Europe and northern Asia, spread round by North America and the Andes down to extratropical South America and even to Australia, such as *Centaurea*, *Hypochœris*, *Cnicus*, &c.; but they appear to be better placed, as instances of extratropical northern connexions, in Table 5. To the same Table belongs also *Hieracium*, which I have added also to the present one on account of the two South-African species belonging to a section more abundant in America than in the Old World, and indicating perhaps an ancient area much more extended than the present one.

2. *Separate distribution of Compositæ into Regions.*

Coming now to the consideration of the separate distribution of Compositæ in America and in the Old World, we may observe one striking difference in this respect in the two divisions of the globe with regard to the extratropical or subtropical races which form the great bulk of the order. In America the northern and southern tribes are the same, although in different proportions; and there are a considerable number of identical genera and even species in the north and in the south. In the Old World, on the contrary, two large northern tribes (Cynaroideæ and Cichoriaceæ) are absent, or very sparingly represented, in the south; whilst the southern Arctotideæ, as well as several subtribes of other tribes, are wanting in the north; and the genera common to the Mediterranean and S.-African regions (excepting cosmopolitan genera) are very few. This great difference in the two divisions of the globe may be due in a great measure to the direction of the great chain of mountains which in America, running north and south, facilitates, or has facilitated, means of intercommunication to races of the constitution of Compositæ, to which the east and west mountain-ranges, plains, and deserts of the Old World only oppose obstacles. In both divisions, omitting the comparatively few Alpine and cosmopolitan races, we have three great specially composite regions which may be at once centres of differentiation of races and areas of preservation of mixed floras, having more of the former character in the Old World and of the latter in America. The Mediterranean, the South-African, and the Australian Compositæ are respectively far more distinct than the Mexican, the Chilian, and the Brazilian, which are, moreover, further connected by what may be termed a fourth intervening region, the Andine; whilst in the Old World the only intermediate connecting-region between the north and south is a very partial one in eastern Africa. I shall now, however, enter into some further details as to each of these regions, as well as in regard to a few others less defined—that is to say, the United-States region in America, and, in the Old World, the western, or African, and eastern, or Asiatic, tropical regions. I add also to the American regions the West-Indian insular group, as being enclosed, as it were, between

North and South America, and closely connected botanically with the united continents, giving altogether six American and six Old-World regions. It must, however, be remembered that these regions have reference to Compositæ alone, and would require great modifications for orders rich in forest-trees, or in paludose or aquatic races, &c., which are, as already observed, so very rare in Compositæ. It must also be borne in mind, in making use of the two following Tables of the distribution of Compositæ in America and in the Old World respectively, that the limits of the regions are in some instances as vague as the absolute numbers of species are uncertain, owing to our insufficient acquaintance with the data on which they should be founded. Such limits as are here had in view will be specially explained in the notes which follow each of the Tables. The insular regions severally connected with the two divisions will be separately considered, and are not included in the totals given in the following Tables 9 to 12.

Table 9. *Number of Species of Compositæ in each of the American Regions.*

Genera.	Number of Species.							Genera in Old World.
	Mexican region.	United States reg.	West Indies.	Andine region.	Brazilian region.	Chilian region.	Total in America.	
VERNONIACEÆ.								
Sparganophorus	...	...	1	...	1	...	1	o. w.
Pacourina	...	...	...	2	1	...	2	
Heterocoma	...	...	...	...	1	...	1	
Oiospermum	...	...	...	...	1	...	1	
Centratherum	...	...	1	2	2	...	2	o. w.
Blanchetia	...	...	...	...	1	...	1	
Vanillosmopsis	...	...	...	...	7	...	7	
Albertinia	...	...	...	...	1	...	1	
Vernonia	20	8	24	32	180	12	250	o. w.
Lachnorhiza	...	...	1	...	...	...	1	
Piptocarpha	...	...	1	4	20	...	24	
Bolanosa	1	...	...	...	...	...	1	
Stilpnopappus	...	...	...	...	14	...	14	
Piptolepis	...	...	...	...	8	...	8	
Oliganthes	2	...	1	4	1	...	8	
Piptocoma	...	...	1	...	...	...	1	
Proteopsis	...	...	...	...	1	...	1	
Stokesia	...	1	...	...	...	...	1	
Haplostephium	...	...	...	...	2	...	2	
Lychnophora	...	...	...	...	17	...	17	
Carried forward	23	9	30	44	258	12	344	

Genera.	Number of Species.							Genera in Old World.
	Mexican region.	United States reg.	West Indies.	Andine region.	Brazilian region.	Chilian region.	Total in America.	
VERNONIACEÆ.								
Brought forward	23	9	30	44	258	12	344	
Lychnophoriopsis	...	...	...	...	1	...	1	
Eremanthus	...	...	...	...	16	...	16	
Pithecoseris	...	...	...	...	1	...	1	
Soaresia	...	...	...	...	1	...	1	
Chronopappus	...	...	...	...	1	...	1	
Telmatophile	...	...	...	...	1	...	1	
Elephantopus	2	1	3	2	9	...	9	o. w.
Rolandra	...	...	1	1	1	...	1	
Spiracantha	...	...	...	1	...	...	1	
Total Vernoniaceæ	25	10	34	48	289	12	376	
EUPATORIACEÆ.								
Piqueria	2	...	...	8	...	...	10	
Phania	...	...	3	...	...	...	3	
Decachæta	2	...	...	...	...	...	2	
Ophryosporus	1	...	...	2	2	2	7	
Helogyne	...	...	...	1	...	...	1	
Gymnocoronis	1	...	...	...	...	1	2	
Adenostemma	1	...	2	1	4	...	5	o. w.
Sclerolepis	...	1	...	...	...	...	1	
Alomia	1	...	...	...	8	...	9	
Trichocoronis	2	...	...	...	...	...	2	
Tuberostylis	...	...	...	1	...	...	1	
Carelia	...	...	...	...	1	...	1	
Aschenbornia	1	...	...	...	...	...	1	
Ageratum	9	1	2	1	6	1	16	o. w.
Schætzelia	1	...	...	...	...	...	1	
Stevia	60	...	...	20	15	5	100	
Dissothrix	...	...	...	...	1	...	1	
Fleischmannia	2	...	...	...	...	...	2	
Hofmeisteria	2	...	...	...	...	...	2	
Carminatia	1	...	...	...	...	...	1	
Trichogonia	...	...	...	1	7	...	8	
Brachyandra	...	...	...	...	...	1	1	
Leptoclinium	...	...	...	...	1	...	1	
Agrianthus	...	...	...	...	2	...	2	
Symphyopappus	...	...	...	...	6	...	6	
Eupatorium	100	24	80	100	100	30	420	o. w.
Mikania	15	1	6	20	30	1	60	o. w.
Kanimia	...	...	...	1	5	...	6	
Adenostyles	1	...	...	...	...	...	1	o. w.
Brickellia	38	1	1	...	1	...	40	
Carpochæte	3	...	...	...	...	...	3	
Kuhnia	...	1	...	...	...	...	1	
Liatris	1	18	...	...	...	...	18	
Trilisa	...	2	...	...	...	...	2	
Carphephorus	2	4	...	...	...	...	6	
Total Eupatoriaceæ	246	53	94	156	189	41	743	

Genera.	Number of Species.							Genera in Old World.
	Mexican region.	United States reg.	West Indies.	Andine region.	Brazilian region.	Chilian region.	Total in America.	
Asteroideæ.								
Gymnosperma	5	...	...	...	...	...	5	
Xanthocephalum	7	...	...	1	...	...	8	
Gutierezia	14	1	...	...	...	6	20	
Grindelia	8	6	...	1	...	8	20	
Pentachæta	2	...	...	...	...	...	2	
Aphantochæta	1	...	...	...	...	...	1	
Steriphe	...	...	...	...	...	1	1	
Bradburia	...	1	..	...	...	...	1	
Heterotheca	5	1	...	...	...	...	5	
Chrysopsis	17	6	...	...	...	...	18	
Hysterionica	...	...	...	...	2	4	5	
Xanthisma	1	...	...	...	...	...	1	
Haplopappus	16	25	1	...	...	24	62	
Chrysothamnus	10	9	...	4	...	...	20	
Ericameria	4	1	...	...	...	...	4	
Solidago	7	72	3	...	1	2	80	o. w.
Brachychæta	...	1	...	...	...	...	1	
Lessingia	4	...	...	...	...	...	4	
Nardophyllum	...	...	...	1	...	5	6	
Lepidophyllum	...	...	...	2	...	3	5	
Chiliophyllum	...	...	...	...	...	1	1	
Læstadia	...	...	...	4	...	...	4	
Egletes	2	1	3	2	1	...	6	
Aphanostephus	3	...	...	...	...	...	3	
Keerlia	2	...	...	...	...	...	2	
Lagenophora	...	...	...	...	...	2	2	o. w.
Bellis	1	1	...	...	...	...	2	o. w.
Monoptilon	1	...	...	...	...	...	1	
Townsendia	3	7	...	...	...	...	8	
Distasis	2	...	...	...	...	...	2	
Chætopappa	...	1	...	...	...	...	1	
Psilactis	3	...	...	...	...	...	3	
Boltonia	3	4	...	...	...	...	7	o. w.
Corethrogyne	6	...	...	...	...	...	6	
Eremiastrum	1	...	...	...	...	...	1	
Sericocarpus	...	5	...	...	...	...	5	
Aster	24	88	...	6	4	7	124	o. w.
Sommerfeldtia	...	...	...	...	...	1	1	
Hinterhubera	...	...	...	3	...	...	3	
Diplostephium	...	...	...	18	...	...	18	
Chiliotrichium	...	...	...	...	...	3	3	
Podocoma	...	...	...	1	3	2	5	o. w.
Brachyactis	...	1	...	...	...	...	1	o. w.
Erigeron	15	33	11	16	5	14	84	o. w.
Vittadinia	...	...	...	...	...	1	1	o. w.
Conyza	6	...	2	5	3	4	11	o. w.
Parastrephia	...	...	...	1	...	...	1	
Baccharis	30	5	7	70	100	40	250	
Heterothalamus	...	...	...	2	...	3	5	
Total Asteroideæ	203	269	27	137	119	131	830	

Genera.	Number of Species.							Genera in Old World.
	Mexican region.	United States reg.	West Indies.	Andine region.	Brazilian region.	Chilian region.	Total in America.	
INULOIDEÆ.								
Stenachænium	...	...	...	...	3	...	3	
Pluchea	6	4	3	3	3	...	12	o. w.
Sachsia	...	...	3	...	...	...	3	
Rhodogeron	...	...	1	...	...	...	1	
Tessaria	1	...	...	4	1	1	5	
Epaltes	1	...	...	...	1	...	2	o. w.
Pterocaulon	...	2	2	1	4	...	6	o. w.
Evax	1	...	...	...	...	...	1	o. w.
Psilocarphus	1	1	...	...	...	1	3	
Micropus	4	...	...	...	...	...	4	o. w.
Diaperia	2	4	...	...	...	...	4	
Micropsis	...	...	...	...	...	1	1	
Filago	1	...	...	...	...	1	2	o. w.
Tafalla	...	...	...	4	...	...	4	
Mniodes	...	...	...	2	...	...	2	
Antennaria	2	7	...	...	...	1	9	o. w.
Luciliopsis	...	...	...	2	...	...	2	
Oligandra	...	...	...	1	1	...	2	
Chionolæna	...	...	...	2	2	...	4	
Leontopodium	...	...	...	2	...	...	2	o. w.
Anaphalis	...	1	...	...	...	...	1	o. w.
Chevreulia	...	...	...	2	2	4	7	
Facelis	...	...	...	1	...	2	3	
Achyrocline	1	...	...	7	4	...	10	o. w.
Gnaphalium	10	11	3	20	3	20	60	o. w.
Stenocline	...	...	...	...	2	...	2	Masc.
Leucopholis	...	...	...	...	2	...	2	
Total Inuloideæ	30	30	12	51	28	31	157	
HELIANTHOIDEÆ.								
Lagascea	7	...	1	1	1	...	7	
Heptanthus	...	...	2	...	...	...	2	
Pinillosia	...	...	3	...	...	...	3	
Tetranthus	...	...	2	...	...	...	2	
Elvira	1	...	1	1	1	...	1	
Lantanopsis	...	...	1	...	...	...	1	
Stachycephalum	1	...	...	...	...	...	1	
Milleria	1	...	...	1	...	...	1	
Adenocaulon	...	1	...	...	...	2	3	o. w.
Riencourtia	...	...	...	...	5	...	5	
Desmanthodium	2	...	...	...	...	...	2	
Clibadium	3	...	6	6	4	...	14	
Ichthyothere	...	...	...	3	6	...	8	
Trigonospermum	2	...	...	...	...	...	2	
Polymnia	4	2	...	6	1	...	12	
Espeletia	...	...	...	11	...	...	11	
Philoglossa	...	...	...	2	...	...	2	
Dicranocarpus	1	...	...	...	...	...	1	
Carried forward	22	3	16	31	18	2	78	

Genera.	Number of Species.							Genera in Old World.
	Mexican region.	United States reg.	West Indies.	Andine region.	Brazilian region.	Chilian, region.	Total in America.	
HELIANTHOIDEÆ.								
Brought forward	22	3	16	31	18	2	78	
Guardiola	4	...	...	...	...	...	4	
Baltimora	1	...	...	1	1	...	1	
Melampodium	15	...	...	4	4	...	18	O. W.
Acanthospermum	...	...	2	...	2	...	2	
Schizoptera	...	...	...	1	...	...	1	
Silphium	...	11	...	...	...	...	11	
Chrysogonum	...	1	...	...	...	...	1	O. W.
Berlandiera	5	...	...	...	...	...	5	
Lindheimera	1	...	...	...	...	...	1	
Engelmannia	1	...	...	...	...	...	1	
Parthenium	4	3	1	1	1	1	6	
Aiolotheca	1	...	...	...	...	...	1	
Parthenice	1	...	...	...	...	...	1	
Iva	1	6	1	...	...	...	7	
Oxytænia	1	...	...	...	...	...	1	
Dicoria	1	...	...	...	...	...	1	
Cyclachæna	1	1	...	...	...	...	2	
Euphrosyne	1	...	...	...	...	...	1	
Hymenoclea	2	...	...	...	...	...	2	
Ambrosia	4	6	3	2	4	2	12	O. W.
Franseria	6	2	...	2	...	3	10	
Xanthium	1	2	1	1	1	2	4	O. W.
Podanthus	...	...	...	...	...	2	2	
Astemma	...	...	...	1	...	...	1	
Tragoceros	4	...	...	...	...	...	4	
Philactis	1	...	...	...	...	...	1	
Zinnia	12	...	...	...	...	...	12	
Sanvitalia	4	...	...	...	...	...	4	
Heliopsis	2	1	...	1	...	...	3	
Aganippea	2	...	...	...	...	...	2	
Monactis	...	...	...	2	...	...	2	
Rumfordia	1	...	...	...	...	...	1	
Siegesbeckia	1	...	...	2	...	2	2	O. W.
Stemmatella	...	...	...	1	...	...	1	
Jægeria	4	...	...	1	1	1	4	
Enhydra	1	...	1	1	4	...	4	O. W.
Aphanactis	...	...	...	2	...	...	2	
Eclipta	1	1	1	1	1	2	2	O. W.
Leptocarpha	...	...	...	...	...	1	1	
Selloa	1	...	...	...	...	...	1	
Axiniphyllum	2	...	...	...	...	...	2	
Abasaloa	1	...	...	...	...	...	1	
Zaluzania	7	...	...	...	...	...	7	
Sabazia	4	...	...	4	...	...	8	
Varilla	2	...	...	...	...	...	2	
Gymnoloma	12	1	...	2	2	...	16	
Sclerocarpus	6	1	...	4	1	...	10	O. W.
Montanoa	11	...	...	3	...	...	14	
Carried forward	152	39	26	68	40	18	280	

Genera.	Number of Species.							Genera in Old World.
	Mexican region.	United States reg.	West Indies.	Andine region.	Brazilian region.	Chilian region.	Total in America.	
HELIANTHOIDEÆ.								
Brought forward	152	39	26	68	40	18	280	
Isocarpha	1	...	2	3	...	...	5	
Rudbeckia	2	23	...	...	...	...	25	
Chromolepis	1	...	...	...	...	...	1	
Balsamorhiza	3	9	...	...	...	...	10	
Tetragonotheca	...	3	...	...	...	...	3	
Wulffia	...	...	2	2	6	...	8	
Mirasolia	2	...	...	...	...	...	2	
Iostephane	2	...	...	...	...	...	2	
Borrichia	1	1	1	1	...	...	2	
Pascalia	...	...	...	...	...	1	1	
Blainvillea	1	...	...	1	3	...	4	o. w.
Wedelia	1	...	8	10	17	...	30	o. w.
Eleutheranthera	...	...	1	1	1	...	1	
Aspilia	2	...	...	2	26	1	28	o. w.
Zexmenia	16	1	2	4	3	1	25	
Oyedæa	2	...	...	9	11	...	22	
Wyethia	2	2	...	...	...	...	4	
Tithonia	5	...	1	...	...	...	5	
Viguiera	18	1	1	16	24	1	60	
Helianthus	10	32	...	10	...	2	52	
Dimerostemma	...	...	...	...	1	...	1	
Perymenium	8	...	...	2	...	...	10	
Melanthera	3	1	3	2	2	...	6	o. w.
Encelia	15	1	...	2	...	3	20	
Helianthella	2	4	...	...	...	...	6	
Actinomeris	3	6	...	...	...	...	9	
Verbesina	27	3	5	18	9	2	50	
Otopappus	...	...	...	1	...	...	1	
Podachænium	1	...	...	...	...	...	1	
Spilanthes	5	2	4	5	7	4	20	o. w.
Salmea	5	...	8	1	...	...	12	
Salmeopsis	...	...	...	...	1	...	1	
Hymenostephium	1	...	...	1	...	...	2	
Chænocephalus	...	...	1	...	...	...	1	
Garcilassa	...	...	...	1	...	...	1	
Synedrella	...	...	1	2	1	...	2	o. w.
Trichospira	...	...	1	...	1	...	1	
Heterospermum	2	...	...	...	3	...	5	
Coreocarpus	2	...	...	...	...	...	2	
Coreopsis	10	27	...	6	...	...	40	o. w.
Dahlia	5	...	...	...	...	...	5	
Hidalgoa	2	...	...	1	...	...	2	
Thelesperma	3	2	...	...	...	1	5	
Cosmos	9	1	2	2	1	...	10	
Bidens	16	7	5	20	12	3	45	o. w.
Narvalina	...	...	1	...	...	...	1	
Isostigma	...	...	...	...	5	...	5	
Chrysanthellum	1	1	1	1	1	2	2	o. w.
Carried forward	341	166	76	192	175	39	836	

Genera.	Number of Species.							Genera in Old World.
	Mexican region.	United States reg.	West Indies.	Andine region.	Brazilian region.	Chilian region.	Total in America.	
HELIANTHOIDEÆ.								
Brought forward	341	166	76	192	175	39	836	
Galinsoga	2	...	1	4	1	1	5	
Calea	14	...	1	18	30	...	60	
Balduina	...	2	...	...	...	...	2	
Marshallia	...	3	...	...	...	...	3	
Blepharipappus	...	1	...	...	...	...	1	
Tridax	5	...	1	3	...	...	7	
Madia	8	2	...	...	...	1	8	
Hemizonia	25	...	...	...	...	...	25	
Lagophylla	3	...	...	...	...	...	3	
Layia	12	1	...	...	...	...	12	
Achyrachæna	1	...	...	...	...	...	1	
Total Helianthoideæ	411	175	79	217	206	41	963	
HELENIOIDEÆ.								
Cacosmia	...	...	...	3	...	...	3	
Geissopappus	...	...	...	...	2	...	2	
Jaumea	3	...	...	...	...	1	4	o. w.
Venegasia	1	...	...	...	...	...	1	
Olivæa	1	...	...	...	...	...	1	
Rosilla	1	...	...	...	...	...	1	
Laphamia	12	...	...	...	...	...	12	
Perityle	2	...	...	...	...	...	2	
Oxypappus	1	...	...	...	...	...	1	
Burrielia	2	...	...	...	...	...	2	
Bæria	5	...	...	...	...	...	5	
Actinolepis	6	...	...	...	...	...	6	
Whitneya	2	...	...	...	...	...	2	
Lasthenia	2	...	...	...	...	1	3	
Monolopia	2	...	...	...	...	...	2	
Hecubæa	1	...	...	...	...	...	1	
Riddellia	3	1	...	...	...	...	3	
Hulsea	6	...	...	...	...	...	6	
Chænactis	11	3	...	...	...	...	12	
Hymenopappus	1	6	...	...	...	...	7	
Syntrichopappus	1	...	...	...	...	...	1	
Bahia	16	4	...	...	...	1	20	
Schkuhria	6	...	...	3	...	2	8	
Hymenothrix	2	...	...	...	...	...	2	
Amauria	1	...	...	...	...	...	1	
Closia	...	...	...	...	...	5	5	
Blennosperma	1	...	...	...	...	1	2	
Villanova	2	2	...	...	...	...	4	
Florestina	2	...	...	...	...	...	2	
Palafoxia	2	4	...	...	...	...	6	
Rigiopappus	1	1	...	...	...	...	1	
Pericome	2	...	...	...	...	...	2	
Galeana	1	...	...	...	...	...	1	
Carried forward	99	21	...	6	2	11	131	

Genera.	Number of Species.							Genera in Old World.
	Mexican region.	United States reg.	West Indies.	Andine region.	Brazilian region.	Chilian region.	Total in America.	
HELENIOIDEÆ.								
Brought forward	99	21	...	6	2	11	131	
Amblyopappus	...	...	...	...	...	1	1	
Thymopsis	...	...	1	...	...	...	1	
Microspermum	1	...	...	...	...	...	1	
Sartwellia	1	...	...	...	...	...	1	
Flaveria	4	1	3	1	1	1	6	o. w.
Porophyllum	10	...	1	3	6	1	15	
Lescaillea	...	...	1	...	...	...	1	
Adenophyllum	3	...	...	...	...	...	3	
Nicolettia	2	...	...	...	...	...	2	
Dysodia	10	2	1	...	...	...	10	
Syncephalanthus	1	...	...	...	...	...	1	
Schizotrichia	...	...	...	1	...	...	1	
Hymenatherum	14	...	...	...	...	1	14	
Thymophylla	3	...	...	...	...	...	3	
Adenopappus	1	...	...	...	...	...	1	
Tagetes	14	...	...	10	4	...	20	
Chrysactinia	1	...	...	...	...	...	1	
Pectis	16	...	8	10	10	...	40	
Clappia	2	...	...	...	...	...	2	
Cephalophora	...	...	...	1	...	4	5	
Helenium	9	12	...	...	...	...	18	
Gaillardia	2	6	...	...	...	2	8	
Actinella	2	9	...	...	...	...	10	
Hymenoxys	2	...	...	...	...	2	4	
Trichoptilium	3	...	...	...	...	...	3	
Psathyrotes	1	...	...	...	...	...	1	
Total Helenioideæ	201	51	15	32	23	23	304	
ANTHEMIDEÆ.								
Achillea	1	3	...	...	...	...	3	o. w.
Leucampyx	1	...	...	...	...	...	1	
Baileya	3	...	...	...	...	...	3	
Chrysanthemum	...	2	...	...	...	...	2	o. w.
Matricaria	...	2	...	...	...	...	2	o. w.
Cotula	2	...	...	1	...	...	3	o. w.
Centipeda	...	...	...	...	...	1	1	o. w.
Plagiocheilus	...	...	...	5	...	1	6	
Soliva	1	...	...	2	2	3	4	o. w.
Abrotanella	...	...	...	...	...	1	1	o. w.
Tanacetum	1	5	...	...	...	...	5	o. w.
Artemisia	3	30	...	...	...	3	32	o. w.
Total Anthemideæ	12	42	...	8	2	9	63	
SENECIONIDEÆ.								
Liabum	6	...	3	32	...	1	40	
Allendea	1	...	...	...	...	...	1	
Carried forward	7	...	3	32	...	1	41	

Genera.	Number of Species.							Genera in Old World.
	Mexican region.	United States reg.	West Indies.	Andine region.	Brazilian region.	Chilian region.	Total in America.	
SENECIONIDEÆ.								
Brought forward	7	...	3	32	...	1	41	
Schistocarpha	3	...	...	2	...	...	5	
Neurolæna	...	...	1	1	...	...	2	
Peucephalum	1	...	...	...	...	...	1	
Luina	...	1	...	...	...	...	1	
Petasites	...	4	...	...	...	...	4	o. w.
Arnica	...	7	...	...	...	...	7	o. w.
Crocidium	...	1	...	...	...	...	1	
Bartlettia	1	...	...	...	...	...	1	
Haploesthes	1	...	...	...	...	...	1	
Raillardella	2	...	...	...	...	...	2	
Melalema	...	...	...	...	...	1	1	
Erechthites	3	1	1	4	4	...	7	o. w.
Culcitium	...	...	...	13	...	1	14	
Senecio	80	38	10	130	25	100	380	o. w.
Gynoxys	...	...	...	12	...	...	12	
Tetradymia	3	2	...	...	...	...	4	
Werneria	1	...	...	17	...	...	18	o. w.
Total Senecionideæ	102	54	15	211	29	103	502	
CALENDULACEÆ.								
Eriachænium	...	...	...	...	...	1	1	
CYNAROIDEÆ.								
Cnicus	20	15	...	...	...	...	35	o. w.
Saussurea	...	1	...	...	...	...	1	o. w.
Centaurea	...	1	...	...	...	5	6	o. w.
Total Cynaroideæ	20	17	...	...	...	5	42	
MUTISIACEÆ.								
Schlechtendahlia	...	...	...	...	1	...	1	
Barnadesia	...	...	...	9	1	...	10	
Chionopappus	...	...	...	1	...	...	1	
Mutisia	...	...	...	18	3	15	36	
Hyalis	...	...	...	1	...	4	4	
Plazia	...	...	...	3	...	...	3	
Gypothamnium	...	...	...	...	...	1	1	
Onoseris	...	...	...	10	1	1	12	
Urmenetea	...	...	...	...	...	1	1	
Chuquiragua	...	...	...	6	15	12	33	
Doniophyton	...	...	...	...	...	1	1	
Wunderlichia	...	...	...	...	1	...	1	
Gochnatia	...	...	1	1	3	3	11	
Moquinia	1	...	...	...	11	...	12	
Cyclolepis	...	...	...	...	...	1	1	
Seris	...	...	...	...	2	...	2	
Stifftia	...	...	...	...	5	...	5	
Carried forward	1	...	1	49	43	39	135	

Genera.	Number of Species.							Genera in Old World.
	Mexican region.	United States reg.	West Indies.	Andine region.	Brazilian region.	Chilian region.	Total in America.	
MUTISIACEÆ.								
Brought forward	1	...	1	49	43	39	135	
Anastraphia	...	...	4	...	...	...	4	
Pachylæna	...	...	...	...	...	1	1	
Lycoseris	...	...	...	10	...	...	10	
Brachyclados	...	...	...	...	...	1	1	
Chætanthera	...	...	...	1	...	25	26	
Trichocline	...	...	...	2	12	8	20	o. w.
Chaptalia	2	1	6	10	3	2	18	
Macrachænium	...	...	...	...	...	1	1	
Leucæria	...	...	...	2	...	23	25	
Oxyphyllum	...	...	...	...	...	1	1	
Polyachyrus	...	...	...	1	...	6	7	
Proustia	1	...	...	2	...	5	7	
Perezia	12	...	...	10	2	22	46	
Leunisia	...	...	...	...	...	1	1	
Trixis	6	...	1	6	18	3	30	
Jungia	...	...	...	9	2	1	12	
Nassauvia	...	...	...	...	...	25	25	
Triptilion	...	...	...	...	...	6	6	
Moscharia	...	...	...	...	...	1	1	
Pamphalea	...	...	...	...	...	5	5	
Cephalopappus	...	...	...	...	1	...	1	
Total Mutisiaceæ	22	1	12	102	81	176	383	
CICHORIACEÆ.								
Microseris	9	2	...	...	...	1	11	o. w.
Krigia	...	4	...	...	...	...	4	
Phalacroseris	1	...	...	...	...	...	1	
Apogon	...	1	...	...	...	...	1	
Picris	1	1	...	...	...	...	1	o. w.
Crepis	1	6	...	...	...	...	6	o. w.
Hieracium	16	12	...	10	2	4	40	o. w.
Malacothrix	9	1	...	...	...	...	9	
Anisocoma	1	...	...	...	...	...	1	
Hypochœris	...	...	...	9	3	15	25	o. w.
Leontodon	...	1	...	...	...	...	1	o. w.
Troximon	2	10	...	...	...	6	16	
Taraxacum	...	1	...	...	...	1	1	o. w.
Pyrrhopappus	1	2	...	...	...	...	2	
Calycoseris	2	...	...	...	...	...	2	
Glyptopleurum	1	...	...	...	...	...	1	
Lactuca	1	8	2	1	...	...	10	o. w.
Prenanthes	...	10	...	...	...	...	10	o. w.
Sonchus	1	1	1	...	...	1	1	o. w.
Pinaropappus	1	...	...	...	...	...	1	
Lygodesmia	...	5	...	...	...	...	5	
Picrosia	...	...	...	...	...	1	1	
Scorzonella	3	2	...	...	...	...	3	
Stephanomeria	6	4	...	...	...	...	8	
Total Cichoriaceæ	56	71	3	20	5	29	161	

Table 10. *Summary of American distribution as compared with the Old World.*

Tribes.	Regions.												Total in America.		Total in Old World.		Common to the two divisions.	
	Mexican.		United States.		West Indies.		Andine.		Brazilian.		Chilian.							
	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.
Vernoniaceæ ...	4	25	3	10	9	34	8	47	24	290	1	12	29	376	14	156	4	3
Eupatoriaceæ ...	21	246	9	53	6	94	11	156	15	189	7	41	35	743	5	16	5	3
Asteroideæ	29	203	20	269	6	27	16	137	8	119	19	131	49	830	44	444	10	8
Inuloideæ.........	11	32	7	31	5	12	13	51	12	28	8	31	27	157	118	950	11	11
Helianthoideæ	90	411	38	175	36	79	57	217	39	206	23	41	125	963	22	77	18	10
Helenioideæ ...	51	201	12	51	6	15	8	32	5	23	13	23	59	304	3	3	2	...
Anthemideæ ...	7	12	5	42	...	...	3	8	1	2	5	9	11	63	41	608	9	15
Senecionideæ ...	11	102	7	54	4	15	8	211	2	29	4	103	19	502	24	687	5	6
Calendulaceæ ...	...	......	...	....	...	...	...	....	...	....	1	1	1	1	7	102	...	...
Arctotideæ	...	......	...	....	...	...	...	....	...	....	...	....	...	....	17	237	...	...
Cynaroideæ......	1	20	3	17	...	...	...	....	...	....	1	5	3	42	37	972	3	1
Mutisiaceæ	5	22	1	1	4	12	18	81	16	101	27	176	38	383	15	60	1	...
Cichoriaceæ ...	16	56	17	71	2	3	3	20	2	5	7	29	24	161	40	610	10	5
Total	246	1330	122	774	78	291	145	980	124	972	116	602	420	4525	387	4922	78	62

NOTES.

1. *Mexican Region.*

I propose the name of Mexican region for a tract of country with a very remarkable Composite character, extending along the great north and south chains of American mountains, and chiefly on its western declivities, from California to Central America, including the greater portion of both. I am unable at present to give it any more definite limits. I have no doubt that materials from which a general line could be drawn might be extracted from the numerous Boundary Surveys of the United-States Expeditions; but that would be a labour which we could only hope to see achieved within a reasonable time by Americans themselves. It is chiefly from a general estimate of the recorded areas of the species we possess, that I would exclude to the north the Oregon territory and northern Rocky Mountains, as characterized by the Asteroid Gnaphaloid Artemisioid and other mountain-races connecting North-American with Asiatic Composites; and to the west the greater part of Texas, as showing, in their Rudbeckioid Helianthoid and other races the characters of the United States rather than of the Mexican region. In the intermediate Salt-Lake region, the limits between the western and eastern Composite floras would seem, by Mr. Serene Watson's 'Introduction to the Nevada and Utah Flora,' to lie in the Washoe Mountains of Western Nevada. To the south, the Compositæ of the *tierra fria* and *tierra templada*, at least of Central America, are decidedly Mexican in character; whilst the hot moist southern provinces show a much greater proportion of Columbian races and would therefore fall into the Andine region; the transition, however, from the one to the other is here evidently gradual and complicated.

It is possible, when better known, that this region may be subdivided into two or more, for there are many genera peculiar either to the northern or to the southern districts; but at present the whole appear to maintain the same general character. The more distinct of the monotypic genera are often confined to limited areas as well in the north as in the south, and those which contain several species either range over the whole area, or the northern and southern species blend very much together; and in the superficial sketch which alone I am able now to give I feel compelled to regard the whole as a single region.

The first peculiarity that strikes one in glancing down the Mexican columns of the above lists is the great diversity of forms shown by the large number of genera, both absolute and in proportion to the species, as compared with most other regions. Those of the Mexican region are about 100 more than in either of the other three most varied regions (246 against 143 in the Andine, 145 in the Mediterranean, and 149 in the South-African regions). Nearly half of these Mexican genera are endemic, with an average of about three species to a genus, and one half of these are quite monotypic—several of them with but few connexions, although not so many perhaps absolutely isolated as in some of the Old-World or insular regions. If we deduct the larger genera which have their chief seat without the region, *Vernonia*, *Eupatorium*, *Aster*, *Senecio*, and *Cnicus*, the average number of species in the whole region is about four to the genus, and even with the addition of the above five it is not much above five to the genus; whilst in the adjoining United-States and Andine regions it is above six, and in the Old World, in the corresponding Mediterranean region, the average is more than thirteen species to a genus. The larger genera of a specially Mexican type which have flourished and established a large number of species and varieties are *Stevia*, also abundant in the Andes, *Brickellia*, scarcely extending beyond the region except in a single tropical species, the homochromous Asteroideæ, some of them repeated in the south, and the Madieæ and Tagetineæ, almost endemic.

The characteristic tribes of the Mexican region are, in the first place, the Helianthoideæ, Helenioideæ, and homochromous Asteroideæ; and, secondly, the Eupatoriaceæ, the former including most of the small endemic genera which mark the region as a great centre of preservation of ancient forms, the latter exhibiting the genera which appear to be now in the greatest degree of prosperity. In the remaining Asteroideæ, Vernoniaceæ, Gnaphalioid Inuloideæ, and even Senecionideæ the endemic genera are few, and those which have numerous endemic species are still richer in the more southern Andine region; the Cichoriaceæ are below those of the adjoining United-States region, although considerably more numerous than those of the adjoining Andine, and even of the more congenial, though distant, Chilian region; the few Mutisiaceæ are the outlying representatives of a South-American and eminently Chilian tribe. A few Old-World, and especially European and Mediterranean, races are here represented more strongly than in the intermediate United States, or in some cases to their exclusion. *Adenostyles californica* is intermediate, as it were, between the two European species. *Leucampyx* is a close representative of the European *Anthemis*; *Baileya* is also nearer to some Old-World *Chrysanthema* than to any American genus; and the Old-World *Cnicus* has more numerous and much more marked Mexican than United-States species.

It is probable that many additions will be made to the Composite flora of the Mexican region by future explorations, and more especially in well-marked endemic monotypes, which, from the severe struggle they have sustained, are generally confined in small numbers to limited localities. The above-mentioned *Leucampyx*, so remarkable in its European connexions, is one of the most recent discoveries, and only reached me, in fact, at the moment when these notes are undergoing the last revision for press.

2. *United-States Region.*

Under this name I would, so far as Compositæ are concerned, include the whole of North America east and north of the Mexican region. It is true that this may be a combination of two floras of separate origin which may appear at first to be very distinct, the Rocky-Mountain British-Columbian and Canadian flora connected with the Asiatic, and the more strictly American flora characterized in Compositæ by such genera as *Helianthus*, *Coreopsis*, *Rudbeckia*, *Solidago*, *Liatris*, &c.; but the two are so blended together that, with the data now at my command, I have been unable to separate them; and both present some general features which may justify the considering the two regions, for the present purpose, as one.

The United-States region presents in its endemic, or almost endemic, genera a great contrast to the Mexican; the strictly endemic genera, indeed, which do not cross into Mexico or California are but very few; but above thirty are almost confined to the region; and if we include in them the *Euaster* section of *Aster*, *Solidago*, and *Helianthus*, which, with *Rudbeckia*, *Liatris*, *Silphium*, *Helenium*, &c., are so characteristic of the region, we have an average of twelve or thirteen species, instead of about four, to a genus. The averages are brought much nearer together if we take into account the representatives of the genera belonging chiefly to other regions; for whilst the Mexican region has a very large number of the southern genera *Vernonia*, *Eupatorium*, &c., the United States have but few species either of specially Mexican or southern genera or of those which belong to the northern regions of the Old World. The general average of species to a genus is thus brought to a little above six (774 species in 122 genera) in the United-States region, against a little over five (1330 species in 246 genera) in the Mexican. This remarkable development of the endemic genera in the United States, compared with the paucity of their species in the Mexican region, may be taken as evidence of the prosperity of progressive races in the former, whilst the Mexican region affords greater protection for the preservation of expiring races.

There are, however, two or three of the United-States monotypes as remarkable in their isolation or distant connexions as any of the Mexican genera. *Stokesia* and *Sclerolepis* have no immediate affinities, the former being intermediate, as it were, between the otherwise distant tribes of Vernoniaceæ and Cichoriaceæ; and *Sclerolepis*, although technically placed among Eupatoriaceæ, differs in habit and foliage from all other Compositæ. *Chrysogonum* is also remarkable from its connexion with the tropical-Asiatic *Moonia*, so close as to force us to unite them in one genus. The other endemic or prevailing genera belong to American tribes subtribes or genera, but with a greater proportion than in any other American region of the Old-World Anthemideæ Cynaroideæ and Cichoriaceæ; whilst the South-American Mutisiaceæ are only represented by a single widely spread species, and the Old-

World southern Cotuleæ Calendulaceæ and Arctotideæ are wholly absent.

It is probable that some modifications in the above relative numbers may ensue from a rectification of the limits now so vaguely assigned to the Mexican and United-States Composite regions; but the flora of the latter has now been so generally investigated that the future discoveries of endemic monotypes are likely to be but very few in proportion to those we may expect from Mexico and California.

3. *West-Indian Region.*

Although the West Indies in their Compositæ show a generally close connexion with the continent of Central and Southern America, yet they are sufficiently separated to exhibit many of the characteristics of insular floras, and to require treating as a separate region. Among the larger islands, Cuba shows more of the character of the Mexican, Jamaica of the Andine, Trinidad of the North-east Brazilian or Guiana region, Porto Rico and San Domingo, which, as far as known, may be considered an extension of the Cuban chain, have as yet been but very imperfectly explored. The connexion of any of the islands with the opposite coast of North America appears in Compositæ to be confined to a few maritime species or to such as have a very wide American range.

Among the characteristic genera of the West Indies may be reckoned *Salmea,* which out of twelve species has eight West-Indian and four Columbian or Mexican, *Neurolæna,* with one West-Indian and one Columbian species, and *Borrichia,* which from the islands extends round the coasts north, south, and west. Each of the larger islands has also its monotypic or small endemic genera, ten in Cuba, *Lachnorhiza, Phania, Sachsia, Rhodogeron, Heptanthus, Pinillosia, Lantanopsis, Thymopsis, Lescaillea,* and *Anastraphia,* averaging two species each, one in Jamaica, the monotype *Chænocephalus,* and three in San Domingo, *Piptocoma, Narvalina,* and *Tetranthus,* the former two monotypic, the latter of two species. These islands partake also of some of the generally dispersed large South- and Central-American genera. Cuba, for instance, has twelve species of *Vernonia,* twenty-four of *Eupatorium,* twelve of *Mikania,* and five or six each of a few others; and in Grisebach's Flora of the British West Indies (slightly modified to reduce the genera to the standard we have adopted) are included twelve species of

Vernonia, thirty-one of *Eupatorium*, ten of *Mikania*, and six or seven each of a few others; but the number of Mexican or South-American genera represented in the islands by single or only by two or three species is sufficient to give, as a general average, not quite three to a genus in Cuba, and rather more than three in the British Islands; or if the whole of the islands, as far as known, are taken into account, the average is brought up nearly to four species to a genus.

The endemic genera of the islands consist generally of herbaceous and often small species; where shrubby they belong to groups which are elsewhere shrubby, and the species of genera common to other countries are not more shrubby than their continental congeners. *Narvalina*, however, may be exceptionally regarded as a shrubby representative of the herbaceous genus *Bidens*. There is no tendency to the arborescent forms of the more isolated islands of the Pacific and Atlantic Oceans. The mountainous islands of Cuba and San Domingo have more the character of detached fragments of a continental mountain-chain which have preserved the remains of a very varied flora, than of really isolated islands that have through a long course of ages modified such races as may have been casually brought to them under former physical conditions.

4. *Andine Region.*

The Andine or west tropical region of South America is but vaguely defined for our present purpose. It is a mountain-tract, connected in the north with the Mexican, to the east with the Brazilian, and to the south with the Chilian region, including generally the Columbian, Ecuadorian, Peruvian, and Bolivian States; but the bordering districts on each frontier are among those of which the vegetation is, perhaps, the least known to us, thus depriving us of the data necessary for determining not only what are the precise limits of the region, but even whether any such can be assigned. The statistics of its Compositæ are thus, as yet, very uncertain. With a marked general character, it contains also numerous species of the great and widely diffused American genera *Vernonia*, *Eupatorium*, *Stevia*, *Mikania*, and *Baccharis*, as well as of the cosmopolitan *Senecio*. Its own genera are connected sometimes with the Mexican ones to the north, sometimes with the Chilian ones to the south, or with the Brazilian to the east; and some of those common to Mexico and

Chili run also along the western declivity of these intermediate Andes. All numbers given in the preceding Tables are in this case, therefore, particularly uncertain, notwithstanding the valuable data supplied by Weddell's 'Chloris Andina.' Accurate as his details are, he followed for the limits of his region chiefly altitude, which affects what Grisebach terms plant-forms and species, rather than genera or other races more indicative of origin, which are mostly very different in the Chilian and Columbian Andes.

In comparing the Compositæ of this region with those of the adjoining Chilian, Brazilian, and especially the Mexican region, a striking peculiarity is the small number of endemic monotypes. They do not exceed ten; and not more than half a dozen endemic genera of two or three species could be added. The physical conditions are not adapted for the preservation of isolated races of varied idiosyncracies; they are too generally uniform to afford the necessary protection against luxuriant races which can freely range over large districts. As in the temperate and mountain regions of the north, this comparative uniformity of physical conditions has given at once a wide range to species and a large average of species to the characteristic genera. These comparatively uniform conditions are also evidently such as to favour the development of Compositæ; and, moreover, the region itself is probably one which was very early inhabited by the order. The total number now known, very nearly the same as that of the Brazilian region, far exceeds that of any other American one except the Mexican. A few of the endemic or nearly endemic genera (such as *Astemma*, some of the Mutisiaceæ, &c.) may be supposed to bear evidences of great antiquity; others appear to be in the height of prosperity and luxuriance; and the region exhibits more arborescent Compositæ than any other, except insular ones.

Among the characteristic tribes of the Andine region the heterochromous Asteroideæ, the Senecionideæ, and Eupatoriaceæ, which take a second place in the Mexican region, may be here placed in the first rank on a par with the Helianthoideæ; the Mexican Helenioideæ and homochromous Asteroideæ are reduced to very few species; and the only endemic races of any higher value are a small Andine section of *Chrysothamnus** (four species), *Cacosmia* (three species), which is almost as near to *Calea* as to its technical cotribuals, and *Schizotrichia*, a single species as yet, perhaps, imperfectly known. Vernoniaceæ, rather more numerous than in the Mexican, are still far below those of the Brazilian region; the Gnaphalioid Inuloideæ, generally mountain plants, are rather more at home than in either. Mutisiaceæ, characteristic of the Chilian region and very rare in the Mexican, have several large and flourishing genera endemic, or, at any rate, with their chief seat, in the Andine region. The Old-World orders partially represented both in the north and south are reduced in the intermediate Andes to fewer numbers than in any American region except the Brazilian: such as are to be met with (*Cotuleæ, Hieracium, Hypochæris*) may be regarded as remnants of those ancient migrations from north to south or from south to north to which I shall allude under Table 10, these remnants having alone survived the altered physical conditions so as to establish a few subordinate endemic races.

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* Since this paper has been in the printer's hands it has been pointed out to me by Asa Gray that De Candolle's name *Bigelovia* has the right of priority for this genus.

Future discoveries may probably add much to the Compositæ of the Andine region, the eastern valleys of the great mountain-range being, as yet, but little explored; but these additions we must expect rather to consist of new species to the prevailing genera, than of such new forms, especially monotypes, as the three adjoining regions may be more likely to supply.

5. *Brazilian Region.*

The Brazilian or east tropical region of South-American Compositæ is that vast tract of country extending from the eastern declivity of the Andes to the Atlantic, southward to the Rio Grande do Sul, and northward to the valley of the Orenoco. It might be supposed to be naturally divided into two, the northern or Guiana and the southern or true Brazilian region, separated by the broad forest-valley or plain of the Amazon, so poor in Compositæ; but, as far as known, the Compositæ peculiar to the mountains east of the Orenoco are generally of a Brazilian type, or, at least, rather Brazilian than Andine; and the few that are characteristic of the low moist valleys of the great rivers spread over too wide an area and are too much interwoven with the others to be made use of for the distinction of separate districts. The statistics of the order in the whole region, however, are as yet more unsettled even than those of the Andine region. This portion of the Brazilian flora is now being worked up, and, when completed, will no doubt give many corrections to the numbers given in the above Table, which are necessarily often little more than conjectural, founded on a hasty turning over of specimens and reference to publications.

We have here, again, as in the Mexican region, a large proportion of endemic monotypes or small genera; but the larger wide-spread American genera, especially *Vernonia*, *Eupatorium*, *Mikania*, and *Baccharis*, are so copiously represented, and some of the characteristic ones so rich in species, that the total average of the region is above seven to the genus, at least one more than in the Andine and two more than in the Mexican. Notwithstanding the large extent of the forest-plains above mentioned, almost as unfavourable for the development and preservation of Composite races as those of east tropical Asia, the physical conditions of the hilly districts appear to be suited both for the preservation of expiring types in limited stations and for the luxurious development of others in the prime of life.

The greater number of the monotypic or small endemic genera of the region belong to the southern portion, the campos and sierras of the Upper Rio San Francisco, and thence to Mattogrosso and Chiquitos, separating the great valleys or plains of the Amazon and the Parana. It is there also that are to be found the most remarkable forms, unrepresented in any other part of America, the *Lychnophoreæ*, *Schlechtendahlia*, *Wunderlichia*, &c., the two latter having no very near connexions anywhere. A few, such as *Pacourina*, *Sparganophorus*, *Riencourtia*, *Trichospira*, &c., belong more specially to the northern or intermediate portion, but extend more or less into Brazil proper, and some of them have crossed over into tropical Africa; others, again, like *Stifftia*, belong to both north and south divisions, with endemic species of limited areas in each.

As characteristic tribes of the region, Vernoniaceæ undoubtedly take the first rank in the number of species, both in relation to the total Compositæ of the region (nearly one third) and in relation to the total number of the tribe in America (more than three fourths, including eighteen endemic genera). Helianthoideæ, mostly of the subtribe Verbesineæ, are also dominant, Eupatoriaceæ rather more numerous than in the Andine region, and Mutisiaceæ about the same, several of the latter having their chief seat or being quite endemic in Brazil. Senecionideæ, especially the genus *Senecio*, and Helenioideæ are fewer than in any other American continental region; so also Asteroideæ, with the exception of *Baccharis* and the Gnaphalioid Inuloideæ. The Old-World orders have but very few species or are quite unrepresented.

Additions to the Composite flora of the region are chiefly to be expected from Mattogrosso and other western districts, and perhaps from the Upper Rio San Francisco, and possibly a few from the unexplored regions of Guiana bordering on Venezuela; but the collections of Schomburgk, Spruce, and others from Guiana and North Brazil have hitherto shown fewer remarkable Compositæ than of several other orders.

6. *Chilian Region.*

The Chilian or extratropical South-American region of Compositæ comprises the whole of that continent south of the Andine and Brazilian ones. It is in some degree a mixed region: the elevated ridge partakes of the general Andine character as to its Compositæ; the extreme south might perhaps be separated as a portion of a general Antarctic region; and many of the strictly Chilian genera, confined to the Cordilleras, do not reach the plains of Buenos Ayres to the east. Yet, on the whole, it is a general area of preservation of Composite races sufficiently distinct from the Andine and Brazilian, which immediately border it on the north, to be regarded as one general region—the more so, as in its repetitions or representations of distant northern races the eastern districts take their proportionate share with the western ones. The flora of Chili proper is perhaps better known than that of Brazil or the Andes; but still there is a large tract of country in the interior, especially where it borders on Bolivia, as well as the provinces of Tucuman and others of La Plata, in regard to which the data are too scattered to enable us to judge readily to which region they should be referred. The Atacama plants described by Philippi evidently belong to the Chilian, and are included under that head in the preceding Table.

The small or monotypic endemic genera, about as numerous as the Brazilian ones, bear a much greater proportion to the total number of Compositæ in the region, although they are still considerably fewer than in the Mexican region. The large American genera *Vernonia*, *Eupatorium*, and *Baccharis* have much fewer representatives than within the tropics, and *Mikania* has but a single species, a deficiency partly compensated by a greater specific luxuriance in *Senecio* and some specially Chilian genera; and the average of species to a genus is brought to a little above five, the same as in the Mexican region. Extratropical South America appears to have afforded physical conditions favourable at once for the preservation of locally limited types, either the remnants of very ancient introductions or differentiated in the region itself, and for the development and differentiation of numerous species in a considerable number of genera.

Among the characteristic tribes Mutisiaceæ evidently come first. This is the sole region in which they are dominant, and so much so as to form nearly one third of the total number of its Compositæ, and to include nearly one half of the whole number of American species of the tribe, fifteen of the twenty-seven genera of the region being almost or quite absolutely endemic. Asteroideæ, especially the homochromous genera corresponding to the Mexican ones, besides *Baccharis* and *Erigeron*, the Gnaphalioid Inuloideæ and Eupatoriaceæ are fairly represented; the more tropical or northern Helianthoideæ and Vernoniaceæ are but very few; Helenioideæ are also few, but more in proportion than in the tropical regions. The European Cichoriaceæ and Anthemideæ also reappear; and even Cynaroideæ and Calendulaceæ are amongst the evidently ancient inhabitants, the former represented by five endemic species of the specially Mediterranean genus *Centaurea*, the latter by an endemic monotype of an otherwise African and Mediterranean tribe.

7. *Connexions between distant American Regions.*

Under this head we can only refer to north and south; for although there is a great difference between the Compositæ of the east and west coasts, both in North and in South America, the regions are continuous; there is no special eastern centre or area of preservation separated by a broad interval from the great western ridge, which might render the appearance of the same genera in both a noteworthy circumstance. The eastern genera, except a few local and monotypic, either extend to the western limits of the region or penetrate continuously into the western region; some of the western genera send a few species into or all over the eastern region, but do not reappear abruptly after a broad interval. But the case is very different with respect to north and south. A considerable number of genera and even some species are established in extratropical North and South America, completely separated by a long tropical interval. The physical or other conditions which have in ancient or modern times admitted of the gradual extension of certain Composite races from east to west or from west to east have not been interrupted by the interposition of impassable barriers; whilst any such continuity between north and south is in the present geological period absolutely broken by the intervention of tropical ungenial regions, far too wide to be crossed by the ordinary gradual progress of plant-races. The reappearance of identical races, generic or specific, in the north and south can therefore only be attributed either to a preexistence of different physical or other extraneous conditions allowing of gradual migrations, or to ancient colonizations through channels which now appear no longer to exist.

These remarks may be illustrated by the following list of genera, identical or representative, in extratropical North and South America, without any, or rarely with only a single, species in the intermediate tropical regions:—

Genera.	Species in extratropical		Genera.	Species in extratropical	
	North Amer.	South Amer.		North Amer.	South Amer.
Gymnocoronis	1	1	Madia	8	1
Gutierrezia	14	6	Jaumea	3	1
Grindelia	8	8	Lasthenia	2	1
Chrysopsis	17		Bahia	19	1
Hysterionica	...	5	Blennosperma	1	1
Haplopappus	38	26	Villanova	4	
Solidago	80	2	Closia	...	5
Ericameria	4		Hymenatherum	14	1
Nardophyllum	...	8	Gaillardia	6	2
Lepidophyllum			Hymenoxys	2	2
Filagineæ	9	3	Artemisia	30	3
Antennaria	8	1	Centaurea	1	5
Adenocaulon	1	2	Microseris	10	1
Franseria	6	3	Troximon	10	6
Encelia	15	3	Scorzonella	3	
Thelesperma	4	1	Picrosia	...	1

Table 11. *Number of Species of Compositæ in each of the Old-World Regions.*

Genera.	Number of Species.							Genera in America.
	Mediterranean region.	Europæo-Asiatic region.	Tropical-African region.	Tropical-Asiatic region.	South-African region.	Australian region.	Total in Old World.	
VERNONIACEÆ.								
Sparganophorus	...	...	1	...	...	...	1	Amer.
Ethulia	...	...	1	2	...	...	2	
Erlangea	...	...	1	...	...	...	1	
Gutenbergia	...	...	5	...	...	...	5	
Centratherum	...	...	1	4	...	1	5	Amer.
Lamprachænium	...	...	...	1	...	...	1	
Bothriocline	...	...	1	...	...	...	1	
Adenoon	...	...	...	1	...	...	1	
Pleurocarpæa	...	...	...	...	...	1	1	
Vernonia	...	...	70	46	15	1	125	Amer.
Hoplophyllum	...	...	...	...	2	...	2	
Herderia	...	...	2	...	...	...	2	
Corymbium	...	...	...	...	7	...	7	
Elephantopus	...	...	2	1	...	1	2	Amer.
Total Vernoniaceæ	...	...	84	55	24	4	156	
EUPATORIACEÆ.								
Adenostemma	...	...	1	1	1	1	1	Amer.
Ageratum	...	...	1	1	1	1	1	Amer.
Eupatorium	2	5	1	5	...	...	10	Amer.
Mikania	...	...	1	1	1	...	1	Amer.
Adenostyles	2	3	...	...	...	...	3	Amer.
Total Eupatoriaceæ	4	8	4	8	3	2	16	
ASTEROIDEÆ.								
Solidago	1	1	...	...	...	...	1	Amer.
Homochroma	...	...	...	...	1	...	1	
Fresenia	...	...	...	...	3	...	3	
Pteronia	...	...	...	...	51	...	51	
Microtrichia	...	...	1	...	...	...	1	
Dicrocephala	1	...	3	4	...	...	5	
Cyathocline	...	...	1	2	...	...	2	
Grangea	...	...	2	1	...	...	2	
Ceruana	1	...	1	...	...	...	1	
Myriactis	1	...	1	5	...	...	5	
Rhynchospermum	...	...	...	1	...	...	1	
Lagenophora	...	...	...	2	...	4	5	Amer.
Garuleum	...	...	...	...	3	...	3	
Steirodiscus	...	...	...	...	2	...	2	
Brachycome	...	...	...	...	1	36	37	
Carried forward	4	1	9	15	61	40	120	

Genera.	Number of Species.							Genera in America.
	Mediterranean region.	Europæo-Asiatic region.	Tropical-African region.	Tropical-Asiatic region.	South-African region.	Australian region.	Total in Old World.	
ASTEROIDEÆ.								
Brought forward	4	1	9	15	61	40	120	
Bellis	6	1	...	...	...	...	6	Amer.
Bellium	3	...	...	...	...	...	3	
Amellus	...	...	...	...	8	...	8	
Gymnostephus	...	...	...	...	6	...	6	
Charieis	...	...	...	...	1	...	1	
Mairia	...	...	...	...	10	...	10	
Minuria	...	...	...	...	...	5	5	
Calotis	...	...	...	...	...	15	15	
Heteropappus	...	5	...	...	...	...	5	
Boltonia	...	5	...	1	...	...	5	Amer.
Callistephus	...	1	...	...	...	...	1	
Aster	8	48	...	...	1	...	50	Amer.
Felicia	...	...	2	...	43	...	45	
Olearia	...	...	...	...	...	63	63	
Celmisia	...	...	...	...	...	1	1	
Podocoma	...	...	...	...	...	1	1	Amer.
Lachnophyllum	1	1	...	...	...	...	2	
Brachyactis	2	4	...	...	...	...	6	Amer.
Erigeron	5	9	2	3	1	4	15	Amer.
Vittadinia	...	...	...	...	...	4	4	Amer.
Microglossa	...	...	3	4	...	...	6	
Nidorella	...	...	2	...	14	...	15	
Conyza	4	...	14	7	9	2	32	Amer.
Psiadia	...	...	2	...	1	...	3	
Adelostigma	...	...	2	...	...	...	2	
Thespis	...	...	...	1	...	...	1	
Heteromma	...	...	...	...	1	...	1	
Chrysocoma	...	...	...	...	8	...	8	
Nolletia	1	...	...	...	3	...	4	
Total Asteroideæ	34	75	36	31	167	135	444	
INULOIDEÆ.								
Brachylæna	...	...	...	...	6	...	6	
Tarchonanthus	...	...	...	...	3	...	3	
Blumea	1	...	3	48	4	7	55	
Laggera	...	...	9	3	...	...	10	
Pluchea	...	1	4	6	...	6	16	Amer.
Pterigeron	...	...	...	...	...	7	7	
Thespidium	...	...	...	...	...	1	1	
Coleocoma	...	...	...	...	...	1	1	
Nanothamnus	...	...	...	1	...	...	1	
Denekia	...	...	1	...	2	...	2	
Epaltes	...	1	3	1	2	2	8	Amer.
Sphæranthus	1	...	4	3	...	2	8	
Carried forward.........	2	2	24	62	17	26	118	

Genera.	Number of Species.							Genera in America.
	Mediterranean region.	Europæo-Asiatic region.	Tropical-African region.	Tropical-Asiatic region.	South-African region.	Australian region.	Total in Old World.	
INULOIDEÆ.								
Brought forward	2	2	24	62	17	26	118	
Pterocaulon	...	...	...	2	...	5	5	Amer.
Blepharispermum	...	...	1	2	...	...	3	
Athroisma	...	...	...	1	...	...	1	
Symphyllocarpus	...	1	...	...	...	...	1	
Evax	9	...	...	...	...	...	9	Amer.
Micropus	3	1	...	...	...	...	3	Amer.
Filago	7	7	...	...	...	...	7	Amer.
Ifloga	1	...	...	1	7	...	8	
Stuartina	...	...	...	...	...	1	1	
Amphidoxa	...	...	...	...	1	...	1	
Chiliocephalum..................	...	...	1	...	...	...	1	
Antennaria........................	1	4	...	...	...	1	5	Amer.
Leontopodium	...	3	...	...	...	...	3	Amer.
Anaphalis	...	13	...	12	...	...	25	Amer.
Pterygopappus	...	...	...	...	...	1	1	
Lasiopogon	1	...	...	...	1	...	2	
Phagnalon	9	1	1	...	...	...	9	
Achyrocline	...	...	6	...	...	...	6	Amer.
Gnaphalium	8	6	10	6	10	8	30	Amer.
Raoulia	...	...	...	...	...	2	2	
Leptorhynchus	...	...	...	...	...	8	8	
Waitzia	...	...	...	...	...	6	6	
Helipterum	...	...	...	...	12	30	42	
Helichrysum	30	3	23	2	137	52	235	
Leontonyx	...	...	...	...	5	...	5	
Pachyrhynchus	...	...	...	...	1	...	1	
Cassinia	...	...	...	...	1	13	14	
Phænocoma	...	...	...	...	1	...	1	
Schœnia	...	...	...	...	...	1	1	
Anaxeton	...	...	...	...	7	...	7	
Petalacte	...	...	...	...	1	...	1	
Ixiolæna...........................	...	...	...	...	...	5	5	
Podotheca	...	...	...	...	...	5	5	
Millotia	...	...	...	...	...	2	2	
Quinetia	...	...	...	...	...	1	1	
Rutidosis	...	...	...	...	...	7	7	
Ammobium	...	...	...	...	...	2	2	
Scyphocoronis	...	...	...	...	...	1	1	
Toxanthus	...	...	...	...	...	2	2	
Eriochlamys	...	...	...	...	...	1	1	
Humea	...	...	...	...	...	4	4	
Acomis	...	...	...	...	...	2	2	
Pithocarpa........................	...	...	...	...	...	1	1	
Ixodia..............................	...	...	...	...	...	1	1	
Cæsulia	...	...	...	1	...	...	1	
Carried forward............	71	41	66	89	201	188	597	

Genera.	Number of Species.							Genera in America.
	Mediterranean region.	Europæo-Asiatic region.	Tropical-African region.	Tropical-Asiatic region.	South-African region.	Australian region.	Total in Old World.	
INULOIDEÆ.								
Brought forward	71	41	66	89	201	188	597	
Myriocephalus	...	...	...	...	...	8	8	
Angianthus	...	...	...	...	...	22	22	
Gnephosis	...	...	...	...	...	12	12	
Calocephalus	...	...	...	...	...	10	10	
Cephalipterum	...	...	...	...	...	1	1	
Gnaphalodes	...	...	...	...	...	3	3	
Eriosphæra	...	...	...	...	1	...	1	
Craspedia	...	...	...	...	...	4	4	
Chthonocephalus	...	...	...	...	...	3	3	
Perotriche	...	...	...	...	1	...	1	
Stœbe	...	...	...	...	19	...	19	
Disparago	...	...	...	...	5	...	5	
Elytropappus	...	...	...	...	6	...	6	
Pterothrix	...	...	...	...	3	...	3	
Amphiglossa	...	...	...	...	3	...	3	
Bryomorphe	...	...	...	...	1	...	1	
Metalasia	...	...	...	...	20	...	20	
Lachnospermum	...	...	...	...	1	...	1	
Nestlera	...	...	...	...	10	...	10	
Anaglypha	...	...	...	...	2	...	2	
Relhania	...	...	...	...	18	...	18	
Rosenia	...	...	...	...	1	...	1	
Leyssera	1	...	...	...	3	...	4	
Macowania	...	...	...	...	1	...	1	
Podolepis	...	...	...	...	...	12	12	
Heterolepis	...	...	...	...	3	...	3	
Athrixia	...	...	2	...	6	5	13	
Antithrixia	...	...	2	...	1	...	3	
Arrowsmithia	...	...	...	...	1	...	1	
Codonocephalum	1	...	...	...	...	...	1	
Inula	24	28	6	5	...	...	52	
Homochæta	...	...	...	...	1	...	1	
Bojeria	...	...	...	...	1	...	1	
Minurothamnus	...	...	...	...	1	...	1	
Cypselodontia	...	...	...	...	1	...	1	
Grantia	4	...	...	...	...	...	4	
Jasonia	2	...	...	...	...	...	2	
Printzia	...	...	...	...	5	...	5	
Iphiona	8	1	1	...	3	...	13	
Pegolettia	...	...	1	...	2	...	3	
Vicoa	4	...	1	1	...	...	6	
Calostephane	...	...	1	...	...	...	1	
Pulicaria	16	2	4	4	1	...	22	
Porphyrostemma	...	...	1	...	...	...	1	
Amblyocarpum	1	...	...	...	...	...	1	
Carried forward	132	72	85	99	322	268	903	

Genera.	Number of Species.							Genera in America.
	Mediterranean region.	Europæo-Asiatic region.	Tropical-African region.	Tropical-Asiatic region.	South-African region.	Australian region.	Total in Old World.	
INULOIDEÆ.								
Brought forward	132	72	85	99	322	268	903	
Carpesium	1	5	...	1	...	...	5	
Geigeria..............	2	...	...	...	8	...	10	
Gymnarrhena	1	...	...	...	...	...	1	
Rhanterium	2	...	...	...	...	...	2	
Anvillea	2	...	...	...	...	...	2	
Ondetia	...	...	...	...	1	...	1	
Buphthalmum	4	3	...	...	...	...	4	
Callilepis	...	...	...	...	2	...	2	
Anisopappus	...	...	2	1	...	...	2	
Odontospermum	5	...	...	...	...	...	5	
Pallenis	1	...	...	...	...	...	1	
Chrysophthalmum	3	...	...	...	...	...	3	
Osmites	...	...	...	...	6	...	6	
Osmitopsis..	...	...	...	...	1	...	1	
Nablonium..............	...	...	...	...	...	1	1	
Oligodora	...	...	...	...	1	...	1	
Total Inuloideæ	153	80	87	101	341	269	950	
HELIANTHOIDEÆ.								
Adenocaulon	...	2	...	...	...	...	2	Amer.
Melampodium	...	...	...	2	...	...	2	Amer.
Chrysogonum	...	...	...	2	...	3	5	Amer.
Ambrosia	2	...	2	1	...	...	2	Amer.
Xanthium	2	...	2	1	...	...	2	Amer.
Siegesbeckia	1	1	1	1	1	1	1	Amer.
Enhydra..............	...	...	1	1	...	...	2	Amer.
Eclipta	...	...	1	1	1	2	2	Amer.
Sclerocarpus	...	...	1	1	...	...	1	Amer.
Blainvillea..............	...	...	2	1	...	...	2	Amer.
Wedelia	...	...	4	6	1	6	14	Amer.
Aspilia	...	...	8	...	...	...	8	Amer.
Melanthera	...	...	2	...	1	...	2	Amer.
Spilanthes	...	...	3	4	1	2	5	Amer.
Guizotia..............	...	...	3	1	...	...	3	
Synedrella	...	...	1	1	...	...	1	Amer.
Glossocardia	...	...	...	1	...	...	1	
Microlecane	...	...	1	...	...	...	1	
Coreopsis	...	...	8	1	...	...	9	Amer.
Bidens	3	2	5	2	1	3	7	Amer.
Glossogyne..............	...	...	...	2	...	3	4	
Chrysanthellum	...	...	1	1	...	...	1	Amer.
Total Helianthoideæ	8	5	46	30	6	20	77	

Genera.	Number of Species.							Genera in America.
	Mediterranean region.	Europæo-Asiatic region.	Tropical-African region.	Tropical-Asiatic region.	South-African region.	Australian region.	Total in Old World.	
HELENIOIDEÆ.								
Jaumea	...	...	1	...	...	...	1	Amer.
Flaveria	...	...	...	...	...	1	1	Amer.
Cadiscus	...	...	...	...	1	...	1	
Total Helenioideæ	...	...	1	...	1	1	3	
ANTHEMIDEÆ.								
Eriocephalus	...	...	...	...	17	...	17	
Lasiospermum	...	...	...	...	4	...	4	
Athanasia	...	...	...	...	40	...	40	
Lonas	1	...	...	...	...	...	1	
Œdera	...	...	...	...	4	...	4	
Eumorphia	...	...	...	...	1	...	1	
Mecomiscus	1	...	...	...	...	...	1	
Anacyclus	10	...	...	...	...	...	10	
Achillea	60	25	...	...	...	...	75	Amer.
Santolina	8	...	...	...	...	...	8	
Diotis	1	1	...	...	...	...	1	
Anthemis	75	10	2	...	...	...	80	
Cladanthus	1	...	...	...	...	...	1	
Lepidostephium	...	...	...	...	1	...	1	
Phymaspermum	...	...	...	...	4	...	4	
Lidbeckia	...	...	...	...	2	...	2	
Thamnophyllum	...	...	...	...	2	...	2	
Cancrinia	...	1	...	...	...	...	1	
Allardia	...	5	...	...	...	...	5	
Chrysanthemum	62	30	...	2	4	...	96	Amer.
Matricaria	12	3	...	...	11	...	20	Amer.
Nananthea	1	...	...	...	...	...	1	
Otochlamys	...	...	...	...	1	...	1	
Cotula	7	1	2	1	22	9	36	Amer.
Cenia	...	...	...	...	8	...	8	
Centipeda	...	...	...	...	2	2	3	
Soliva	...	...	...	...	...	1	1	Amer.
Abrotanella	...	...	...	...	...	3	3	Amer.
Ceratogyne	...	...	...	...	...	1	1	
Elachanthus	...	...	...	...	...	1	1	
Isoetopsis	...	...	...	...	...	1	1	
Peyrousea	...	...	...	...	1	...	1	
Schistostephium	...	...	...	...	6	...	6	
Marasmodes	...	...	...	...	3	...	3	
Stilpnophytum	...	...	...	...	2	...	2	
Asæmia	...	...	...	...	1	...	1	
Pentzia	...	...	...	...	10	...	10	
Tanacetum	16	15	...	...	...	...	30	Amer.
Hippia	...	...	...	...	4	...	4	
Carried forward	255	91	4	3	150	18	487	

Genera.	Number of Species.							Genera in America.
	Mediterranean region.	Europæo-Asiatic region.	Tropical-African region.	Tropical-Asiatic region.	South-African region.	Australian region.	Total in Old World.	
ANTHEMIDEÆ.								
Brought forward	255	91	4	3	150	18	487	
Crossostephium	...	1	...	...	...	...	1	
Artemisia	95	30	2	2	1	...	120	Amer.
Total Anthemideæ	350	122	6	5	151	18	608	
SENECIONIDEÆ.								
Gongrothamnus	...	...	2	...	...	...	2	
Tussilago	1	1	...	...	...	...	1	
Petasites	2	7	...	...	...	...	8	Amer.
Homogyne	...	3	...	...	...	...	3	
Cremanthodium	...	5	...	...	...	...	5	
Alciope	...	...	...	...	2	...	2	
Arnica	1	1	...	...	...	...	1	Amer.
Doronicum	5	8	...	...	...	...	10	
Lopholæna	...	...	...	...	2	...	2	
Erechthites	...	...	...	...	...	6	6	Amer.
Stilpnogyne	...	...	...	...	1	...	1	
Gynura	...	4	3	14	...	1	20	
Cineraria	...	...	3	...	22	...	25	
Emilia	...	...	1	5	...	1	5	
Notonia	...	...	...	2	...	...	2	
Senecio	90	110	40	40	190	28	460	Amer.
Bedfordia	...	...	...	...	...	2	2	
Othonnopsis	3	...	...	...	5	...	8	
Werneria	...	1	1	...	...	...	2	Amer.
Oligothrix	...	...	...	...	1	...	1	
Echinops	...	...	1	...	26	...	27	
Gamolepis	...	...	...	...	12	...	12	
Gymnodiscus	...	...	...	...	2	...	2	
Othonna	...	...	...	...	80	...	80	
Total Senecionideæ	102	140	51	61	343	38	687	
CALENDULACEÆ.								
Ruckeria	...	...	...	...	2	...	2	
Dimorphotheca	...	...	...	...	20	...	20	
Calendula	10	1	...	...	...	...	10	
Dipterocome	1	...	...	...	...	...	1	
Oligocarpus	...	...	...	...	3	...	3	
Tripteris	...	...	1	...	27	...	28	
Osteospermum	...	...	...	...	38	...	38	
Total Calendulaceæ	11	1	1	...	90	...	102	

Genera.	Number of Species.							Genera in America.
	Mediterranean region.	Europæo-Asiatic region.	Tropical-African region.	Tropical-Asiatic region.	South-African region.	Australian region.	Total in Old World.	
ARCTOTIDEÆ.								
Ursinia	...	...	1	...	54	...	54	
Landtia	...	...	2	...	2	...	4	
Haplocarpha	...	...	1	...	4	...	4	
Cymbonotus	...	...	...	...	...	1	1	
Arctotheca	...	...	...	...	1	...	1	
Cryptostemma	...	...	...	...	3	...	3	
Arctotis	...	...	1	...	30	...	31	
Venidium	...	...	...	...	18	...	18	
Gorteria	...	...	...	...	4	...	4	
Gazania	...	...	...	...	24	...	24	
Hirpicium	...	...	...	...	2	...	2	
Cullumia	...	...	...	...	14	...	14	
Berkheya	...	...	1	...	69	...	70	
Stephanocoma	...	...	...	...	1	...	1	
Didelta	...	...	...	...	3	...	3	
Gundelia	1	...	...	...	...	...	1	
Platycarpha	...	...	...	...	2	...	2	
Total Arctotideæ	1	...	6	...	231	1	237	
CYNAROIDEÆ.								
Echinops	60	12	4	1	...	...	70	
Acantholepis	2	...	...	...	...	...	2	
Cardopatium	2	...	...	...	...	...	2	
Xeranthemum	5	...	...	...	...	...	5	
Chardinia	1	...	...	...	...	...	1	
Siebera	1	...	...	...	...	...	1	
Amphoricarpus	1	...	...	...	...	...	1	
Carlina	10	5	...	...	...	...	12	
Atractylis	12	2	...	...	...	...	14	
Thevenotia	2	...	...	...	...	...	2	
Arctium	2	1	...	...	...	...	2	
Cousinia	128	4?	...	...	...	...	130	
Carduus	46	26	2	...	...	...	60	
Cnicus	100	40	4	2	...	...	130	Amer.
Onopordon	12	1	...	...	...	...	12	
Cynara	6	...	...	...	...	...	6	
Silybum	1	1	...	...	...	...	1	
Galactites	3	...	...	...	...	...	3	
Tyrimnus	1	...	...	...	...	...	1	
Stæhelina	6	...	...	...	...	...	6	
Kœchlia	1	...	...	...	...	...	1	
Saussurea	...	75	...	1	...	1	75	Amer.
Goniocaulon	...	...	...	1	...	...	1	
Jurinea	31	19	...	...	...	...	40	
Berardia	...	1	...	...	...	...	1	
Carried forward	433	187	10	5	...	1	579	

Genera.	Number of Species.							Genera in America.
	Mediterranean region.	Europæo-Asiatic region.	Tropical-African region.	Tropical-Asiatic region.	South-African region.	Australian region.	Total in Old World.	
CYNAROIDEÆ.								
Brought forward	433	187	10	5	...	1	579	
Warionia	1	...	...	...	...	...	1	
Myopordon	1	...	...	...	...	...	1	
Serratula	18	15	...	...	...	...	30	
Tricholepis	1	2	...	6	...	...	7	
Crupina	2	...	...	...	...	...	2	
Volutarella	5	...	...	...	...	...	5	
Zoegea	2	...	...	...	...	...	2	
Leuzea	2	...	...	...	...	...	2	
Centaurea	295	34	6	2	...	1	310	Amer.
Carbenia	1	...	...	...	...	...	1	
Carthamus	18	...	...	...	...	...	18	
Carduncellus	14	...	...	...	...	...	14	
Total Cynaroideæ	793	238	16	13	...	2	972	
MUTISIACEÆ.								
Pleiotaxis	...	...	1	...	...	...	1	
Erythrocephalum	...	...	3	...	...	...	3	
Phyllactinia	...	...	1	...	...	...	1	
Leucomeris	...	...	...	1	...	...	1	
Dicoma	...	...	2	1	11	...	13	
Hochstetteria	1	...	1	...	...	...	1	
Anisochæta	...	...	...	...	1	...	1	
Ainsliæa	...	8	...	3	...	...	10	
Pertya	...	2	...	...	...	...	2	
Macroclinidium	...	1	...	...	...	...	1	
Myripnois	...	1	...	...	...	...	1	
Catamixis	...	...	...	1	...	...	1	
Oldenburgia	...	...	...	...	3	...	3	
Trichocline	...	...	...	...	...	1	1	Amer.
Gerbera	...	1	1	4	15	...	20	
Total Mutisiaceæ	1	13	9	10	30	1	60	
CICHORIACEÆ.								
Scolymus	3	...	...	...	...	...	3	
Catananche	5	...	...	...	...	...	5	
Hymenonema	1	...	...	...	...	...	1	
Hænseleria	1	...	...	...	...	...	1	
Cichorium	2	1	...	...	...	...	2	
Microseris	...	...	...	...	...	1	1	Amer.
Arnoseris	1	1	...	...	...	...	1	
Hyoseris	4	1	...	...	...	...	4	
Tolpis	15	...	...	...	...	...	15	
Hispidella	1	...	...	...	...	...	1	
Lapsana	4	2	...	...	...	...	4	
Carried forward	37	5	...	...	...	1	38	

Genera.	Number of Species.							Genera in America.
	Mediterranean region.	Europæo-Asiatic region.	Tropical-African region.	Tropical-Asiatic region.	South-African region.	Australian region.	Total in Old World.	
CICHORIACEÆ.								
Brought forward	37	5	...	...	...	1	38	
Kœlpinia	1	...	...	...	...	...	1	
Rhagadiolus	5	1	...	...	...	...	5	
Heteracia	2	...	...	...	...	...	2	
Acanthocephalus	1	1	...	...	...	...	2	
Zacintha	1	...	...	...	...	...	1	
Rodigia	1	...	...	...	...	...	1	
Phalacroderis	1	...	...	...	...	...	1	
Picris	22	3	...	...	1	1	22	Amer.
Crepis	60	35	...	...	1	1	90	Amer.
Phæcasium	3	1	...	...	...	...	3	
Pterotheca	5	...	...	...	...	...	5	
Hieracium	60	70	...	...	2	...	110	Amer.
Andryala	6	...	...	...	...	...	6	
Hypochœris	8	5	...	...	1	1	10	Amer.
Leontodon	35	10	...	...	...	...	40	Amer.
Taraxacum	6	2	...	...	1	1	6	Amer.
Chondrilla	6	10	...	...	...	...	15	
Lactuca	30	30	5	8	2	...	60	Amer.
Heterachæna	...	...	1	...	...	...	1	
Prenanthes	2	4	...	...	...	...	6	Amer.
Picridium	6	...	...	...	...	...	6	
Dianthoseris	...	...	1	...	...	...	1	
Sonchus	18	4	2	1	4	1	24	Amer.
Microrhynchus	18	...	1	3	1	...	20	
Tragopogon	25	8	...	...	...	...	30	
Urospermum	2	...	...	...	...	...	2	
Scorzonera	96	8	...	...	...	...	100	
Epilasia	1	1	...	...	...	...	1	
Tourneuxia	1	...	...	...	...	...	1	
Total Cichoriaceæ	459	198	10	12	13	6	610	

Table 12. *Summary of Old-World distribution as compared with American.*

Tribes.	Regions.												Total in Old World.		Total in America.		Common to the two divisions.	
	Mediterranean.		Europæo-Asiatic.		Tropical African.		Tropical Asiatic.		South-African.		Australian.							
	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.	G.	Sp.
Vernoniaceæ ...	...	...	...	...	9	84	6	55	3	24	4	4	14	156	29	376	4	3
Eupatoriaceæ ...	2	4	2	8	4	4	4	8	3	3	2	2	5	16	35	743	5	3
Asteroideæ	12	34	9	75	13	36	11	31	19	167	10	135	44	444	49	830	10	8
Inuloideæ	29	155	16	82	22	87	19	101	51	341	43	269	118	950	27	157	11	11
Helianthoideæ..	4	8	3	5	17	46	18	30	6	6	7	20	22	77	125	963	18	10
Helenioideæ ...	...	...	...	...	1	1	...	...	1	1	1	1	3	3	59	304	2	...
Anthemideæ ...	15	350	11	122	3	6	3	5	23	151	7	18	41	608	11	63	9	15
Senecionideæ ...	6	102	9	140	7	51	4	61	11	343	5	38	24	687	19	502	5	6
Calendulaceæ ...	2	11	1	1	1	1	...	...	5	90	...	...	7	102	1	1	...	...
Arctotideæ	1	1	...	...	5	6	...	...	15	231	1	1	17	237	...	...	...	...
Cynaroideæ......	34	793	15	238	4	16	6	13	...	...	2	2	37	972	3	42	3	1
Mutisiaceæ	1	1	5	13	6	9	5	10	4	30	1	1	15	60	38	383	1	...
Cichoriaceæ ..	37	459	20	198	5	10	3	12	8	13	6	6	40	610	24	161	10	5
Total	143	1918	91	882	97	357	79	326	149	1400	89	497	387	4922	420	4525	78	62

NOTES.

1. *Mediterranean Region.*

The Mediterranean or, as it might perhaps be more accurately designated, the Mediterraneo-Persian region, must, so far as Compositæ are concerned, be taken in a rather wider sense than that assigned to it by Grisebach; for the whole of Boissier's 'Flora Orientalis' is so strongly impressed with the Mediterranean type as to be inseparable from it in a general view. The region would thus comprise the three great South-European peninsulas up to the southern declivities of the Pyrenees the Cevennes the Alps and the Balkan, Asia Minor and the Levant generally, including Persia and Afghanistan, although with eastern limits at present somewhat vague; whilst the southern boundary would lie along the tropical or subtropical little-known mostly desert lands of Arabia and Africa to the Atlas, extending westward in some respects even to the Canary Islands, although on the present occasion their Compositæ are not included in the preceding Table as requiring separate consideration from their insular character. It might be thought, perhaps, that this vast region ought to have been divided; and there certainly are differences between many of the Composite races of the east and the west. There is, for instance, no *Cousinia* west of Boissier's flora, no *Tolpis* or *Calendula* in Persia; but in general the genera of the two extremities are so blended together, so many of the smaller ones with species of limited areas are represented both in west Mediterranean Africa and in Persia, there are so many evidences of ancient continuity and interchange of races, that I have been unable to suggest any division useful for our present purpose.

The flora of the greater part of this region has now been very fairly investigated; or, at least, copious materials for working it out have accumulated in our herbaria; but much remains to be done before they can be made properly available for geographical purposes, before any real accuracy can be given to the figures given in the preceding Table. It has often been a matter of great uncertainty to me as to which of the species are so far limited to the southern declivities of the great east-and-west chains of mountains as to belong to the Mediterranean, not to the Europæo-Asiatic, region, or how far a few mountain species which extend into the higher ranges of the three peninsulas should or should not be included in the Mediterranean flora. The stations given in the floras of Spain, Italy, and the Caucasus will require to be much more carefully tabulated than I have had time to do it. Boissier's most valuable Oriental Flora has not yet reached the Compositæ; and even when that is done, there will still remain the Turkish peninsula and a great portion of Mediterranean Africa, of which the Composite statistics are very vague. So local also are many of the most marked species and genera that we may still expect that a considerable number have been overlooked in the southern and eastern districts, though, probably, the additions will not be so large as in the case of the Mexican region.

This Mediterranean region, however, is undoubtedly by far the richest in Compositæ of all those into which I have divided the area of the order. It surpasses the South-African by 500, the Mexican by 600, species, and contains nearly two fifths of the whole number of Old-World Compositæ. It may not be so diversified as either of the two just mentioned; for the genera, about the same in number as the South-African, are not much more than half those of the Mexican region, and more of the thirteen tribes are scarcely or not at all represented; but a large proportion of the genera (about half) are endemic, and about half of these are almost or quite monotypic. On the other hand, so large is the number of species of some endemic or prevailing genera, such as *Cousinia*, *Centaurea*, &c., that the general average is brought up to full fourteen to a genus, or much higher than in any other region.

Although the diversity exhibited, as tested by the number of genera both absolute and proportional, may thus be far below that of the Mexican region, yet the Mediterranean in other respects, owing, probably, to its extraordinarily broken physical conditions, shows quite as much the preservation or development of distinct forms in restricted localities as that or any other of our regions. The above-mentioned genus *Cousinia* is the most remarkable instance in the order of a large number of species confined to a comparatively small area; the whole 130 are limited to the Asiatic portion of the region. This far surpasses any single one of the numerous instances of large Composite genera of very limited areas exhibited by the South-African region. At the same time such monotypes as *Gymnarrhena, Rhanterium, Dipterocome, Gundelia, Warionia, Hochstetteria, Hymenonema, Hænseleria, Acanthocephalus, Tourneuxia,* and a few oligotypes, are almost, if not quite, as widely distinct from their cotribuals as any South-African or Mexican monotypes. The Mediterranean region can thus bring forward evidences at once of the great present luxuriance of its Composite races, as well as of the great antiquity of several of them.

Of the monotypic or other genera of very limited areas, the majority are Oriental, chiefly Persian; but *Hænseleria* and *Hispidella* are Spanish; *Rhanterium, Mecomiscus, Warionia,* and *Tourneuxia* are Algerine; *Grantia, Anvillea,* and *Cardopatium* are represented by Algerine and by Oriental species without occurring in the intermediate districts; *Nananthea* and *Phalacroderis* are insular; none belong exclusively to the Italian or to the Turkish peninsula.

Among the prevailing tribes, the Cynaroideæ, Cichoriaceæ, and Anthemideæ, all specially Old-World tribes, are the most characteristic. The region contains four fifths of the Old-World species of the first, three fourths of the second, and above half of the Anthemideæ. It is also the special seat of three subtribes of the Inuloideæ, the Filagineæ, Euinuleæ, and Buphthalmeæ. In Senecionideæ, Asteroideæ, and Calendulaceæ the numbers are far below those of the South-African region; the southern Arctotideæ and Mutisiaceæ have each only a single species encroaching on its frontier; the American Eupatoriaceæ and Helianthoideæ are but very scantily, the Vernoniaceæ and Helenioideæ not at all represented.

2. *Europæo-Asiatic Region.*

Under the name of Europæo-Asiatic or North temperate and Mountain region of the Old World, I would designate that vast area extending from the Atlantic to the North Pacific, which has been so frequently adverted to as presenting a remarkable continuity in the character of its vegetation through its entire length, a character fully maintained in respect of Compositæ. Its limits would at first sight appear to be more readily fixed than those of some other regions, although on investigation numerous difficulties occur. It should include all the mountain-races which inhabit the Pyrenees, the Alps, the Caucasus, and the Himalayas; but along the whole range it is often no easy problem to separate the southern races which have ascended or maintained themselves with or without specific modification in the warmer valleys, or the northern or mountain ones which, carried down to the lower grounds at their southern feet, have there become definitively established. At the eastern extremity, also, that intermixture of northern and southern forms which I have commented upon in recent Anniversary Adresses is exemplified in Compositæ, as in other orders, interfering with any definite line of demarcation.

The region is rich in Compositæ. It has not, it is true, half the numbers of the Mediterranean; but it is richer than the corresponding American (United States) region, although less diversified. With a hundred more species, the genera are fewer by thirty; and the local endemic monotypes can scarcely be computed at more than ten, unless, indeed, we consider as such a few species which have, on slight technical characters, been raised to that grade; and even among those ten none have so marked a character as some of the American ones. If, again, the Europæo-Asiatic species are numerous, averaging nearly ten to a genus, the varieties are still more so, and individual species, as well as the prevailing genera, have very large areas, many of them extending from one end to the other of the region. This prevents the separation of a European from an Asiatic region which the presence of a few endemic genera in each might at first sight have suggested.

Two small genera only are limited to Europe, *Adenostyles* and *Homogyne*; the former, represented by a closely allied species in California, belongs to a tribe (Eupatoriaceæ) which is essentially American, although it be in some respects an outlying member tending towards the *Cacalia* group of the cosmopolitan *Senecio*;

the other genus, *Homogyne*, is one of the *Tussilago* group, chiefly Europæo-Asiatic, but also extending into North America, where, indeed, the section *Nardosmia* of *Petasites* is, perhaps, the nearest connexion of the European *Homogyne*. To these two European genera, not extending into Asia, might perhaps be added *Berardia*; but, although limited to the Alps of Dauphiné, that plant is so essentially Mediterranean in its character that it seems to be more appropriately regarded as an outlying member of the Mediterranean flora.

After deducting a few Mediterranean species which have extended northwards over the temperate portions of our Europæo-Asiatic region, and perhaps a few endemic species which Mediterranean genera have there established, the great majority of the genera are essentially Asiatic—many of them exclusively so, others gradually diminishing in species as they extend westward; and some of them, as shown in Table 5, are also represented by identical species or by congeners in North America. All these, together with the two above-mentioned European genera, must probably have had their origin in the flora which has often been commented on as having once extended over the greater part of the higher northern region of the globe, and of which we have now sometimes detached remnants preserved in limited localities often at great distances from each other, sometimes thriving descendants which have multiplied in species and individuals over a large portion of the area.

To these probably very ancient denizens of the region must be added in its eastern portion a few genera of one or two species each, *Myripnois, Pertya, Macroclinidium*, which, with the northern species of *Ainsliæa* and perhaps *Leucomeris* and *Catamixis*, are the northern representatives of the essentially southern tribe of Mutisiaceæ. These, with *Gynura, Tricholepis*, and other southern genera of other tribes, are instances of that interchange of northern and southern races in eastern Asia to which I have above alluded, the return being made in the few species of *Eupatorium, Boltonia, Anaphalis, Chrysanthemum, Artemisia, Saussurea*, &c., which, from the Europæo-Asiatic region, have in its eastern portion protruded southward to within the tropics, one, *Saussurea*, crossing over even into Australia.

I can find no traces in Compositæ of that strictly western flora exemplified in *Lobelia, Erica, Ulex*, and other Genisteæ, &c., owing possibly to the supposed less ancient origin of the order.

The chief characteristic tribes of the region are, as in the Mediterranean:—first, the Cynaroideæ; secondly, the Cichoriaceæ; and, thirdly, the Anthemideæ. Beyond that the sequence is different. Senecionideæ, Asteroideæ, and Gnaphalioid Inuloideæ are richer in species, though not in genera, than in the Mediterranean region, owing either to the mountainous character or to the American connexion of their genera; whilst the Mediterranean subtribes of Inuloideæ are much reduced in the Europæo-Asiatic region. The connexion with America gives also a few more species of Eupatoriaceæ; and the above-mentioned Mutisiaceæ are unrepresented in the Mediterranean. The other American or southern tribes are again insignificantly represented in or totally absent from the Europæo-Asiatic region.

Fewer additions may be expected to be made to the Compositæ of this region than to those of perhaps any other, although many corrections will have to be made to the figures of the preceding Table when the rich materials accumulated at Kew shall have been worked up for the Indian flora, and when Maximovicz will have concluded the revision he has so well begun of the principal Composite genera of North-eastern Asia.

3. *Tropical-African Region.*

In respect of geographical distribution tropical Africa is one of the most interesting regions for investigation in its Compositæ as in other orders, though with some differences. It is essentially a connecting region, one which, besides its present adjoining neighbours, gives indications of ancient connexions now so completely broken off by wide impassable intervals as to leave us to very vague guesses only of how such ancient connexions could have been effected. We have examined already into its correspondence with tropical America in Composite genera and representative species, of which examples might be produced from other orders. The occurrence, however, of identical genera and closely representative species in tropical Africa and Australia observed among arborescent Cæsalpineæ, Mimoseæ, Malvaceæ, &c. has not been verified in Compositæ. Whether or not this is any ways the result of the rarity of the arborescent plant-form in Compositæ is a matter of mere conjecture. The more immediate connexions are with the Indian or tropical-Asiatic region to the east, and with the two rich Composite regions, the Mediterranean to north and the South-African to the south. In itself tropical Africa cannot be said to be rich in Compositæ, especially in species, very much less so than tropical America, but the forms are more varied. All the tribes are represented in it, although the three in which its neighbour the Mediterranean region is so rich (the Cynaroideæ, Cichoriaceæ, and Anthemideæ) have but very few species, and those few chiefly in the Abyssinian mountains, which have some connexion northwards. The southern Mutisiaceæ and Arctotideæ are also as scantily represented; the Calendulaceæ, an African tribe both northern and southern, have, as far as known, only a single species within the tropics. All these, however, are chiefly extratropical tribes. Those which exhibit in tropical Africa the greatest numbers are among those which elsewhere have a more tropical character:—Vernoniaceæ, of which the genus *Vernonia* alone numbers seventy species, including the considerable endemic section *Stengelia*; Inuloideæ, chiefly Plucheineæ and Gnaphalieæ, also, however, with several of the more specially African subtribes Euinuleæ and Buphthalmeæ; and Helianthoideæ, chiefly American types. The American Eupatoriaceæ, notwithstanding their semitropical character, as well as the Helenioideæ, are represented each only by a single endemic species, and the Eupatoriaceous one is probably a modification of an Asiatic rather than of an American *Eupatorium*; the three other tropical-African Eupatoriaceæ which figure in the preceding Table are amphigeous species enumerated in Table 4, the origin of whose dispersion is uncertain, but which might be supposed to be of ancient introduction from America.

The numbers, however, of all the above tribes are small; the only large genera are *Vernonia* and *Helichrysum*; all the others, except *Gnaphalium* and *Conyza*, have less than ten species; and the general average, including *Vernonia*, is under four to a genus, lower than in any region except limited insular ones. The total number of species is also much smaller than in any except the tropical-Asiatic region; whilst the genera are more numerous and more diversified than in the tropical-Asiatic, the Australian, or the Europæo-Asiatic regions. About twenty of them are endemic: the majority of these, as well as of the endemic species of other genera, appear to be limited to the eastern portion of the region; it is there chiefly that several South-African and American genera are represented by single or very few species, and there also that some of the Mediterranean genera extend a few representatives. East tropical Africa seems, indeed, to be the principal area of preservation of the most ancient tropical flora of the Old World. The

American identical species are more specially in West Africa, accompanying a smaller number of endemic species and genera.

There is, however, much yet to be discovered before the Compositæ of tropical Africa are sufficiently known to establish reliable proportions. Even the materials we have are not fully worked out, this part of Oliver's Flora, although far advanced, not being yet completed; and it is probable that the number of marked endemic forms, often connecting genera or higher races which are elsewhere distinct, will be considerably increased by future explorers. We have, indeed, already indications of two species which may have to be added to the endemic monotypes: one is the *Moquinia Bojeri*, DC., Prod. vii. 23, from Zanzibar, which, with its short corolla-lobes, is certainly out of place amongst Gochnatieæ and may possibly be some Inuloid allied to *Printzia*; the other is a fine plant with *Eryngium*-like prickly-toothed single leaves, and large almost *Stifftia*-like heads, of which we have seen several specimens in Afzelius's herbarium, and one in the Kew herbarium collected by Barter on the Niger; in all these specimens the corolla-limb and upper parts of the anthers and style are eaten off or rotted away, so as to render the fixation of their affinities impossible; but the anther-tails remaining in Barter's specimen seem to indicate a new Mutisiaceous genus allied to *Dicoma*.

4. *Tropical-Asiatic Region.*

This comprises the Indian peninsula, the plains and lower hills of India to the foot of the Himalayas, the island of Ceylon, the Malayan peninsula, and the Indian archipelago. It is at once the poorest in Compositæ and the least diversified of all the continental regions, exemplifying on a large scale the characteristics of the low forest-lands of east tropical South America mentioned under the Brazilian region. It is only the Nilgherry range, bordering the western side of the peninsula, that possesses a few endemic monotypes (*Adenoon*, *Lamprachænium*, *Nanothamnus*, *Athroisma*) with restricted stations marking the site as a centre of preservation of detached races. The same hills have also endemic species of other genera of the same local character; but neither Ceylon nor any of the islands of the archipelago nor the Malayan peninsula, as far as known, have a single endemic genus of Compositæ, none more than a few species that do not also spread more or less over the Indian continent. A large proportion, indeed, of the true denizens (the Blumeas and allies, the Grangeineæ, most Helianthoideæ,

&c.) are little more than weeds which spring up rapidly in numerous individuals where a forest has been cleared or cultivated ground abandoned; and even these decrease eastward. If the known Compositæ of the Indian archipelago were reduced to our ordinary standard they would not probably extend to above 110 to 120 species. Beccari's collection of 1849 Sarawak plants as received at Kew contained only six Compositæ, including such ubiquitous weeds as *Ageratum*, *Spilanthes*, and *Crepis* (*Youngia*), and a very common *Blumea* and *Vernonia*.

The principal Composite genera or races of a higher grade prevalent in tropical Asia are *Vernonia*, *Blumea* and allies, *Conyza* and allies, Grangeineæ, Gnaphalioid Inuloideæ, and Senecionideæ. No others can count ten species, the most remarkable among them being a few Mutisiaceæ mostly allied to South-African ones, but with some special types, such as *Ainsliæa* and *Tricholepis* (the only genus of Cynaroideæ which is chiefly tropical). Three tribes, the American Helenioideæ and the South-African Calendulaceæ and Arctotideæ, are wholly unrepresented in tropical Asia.

It is not probable that future investigations will add very materially to the Compositæ of the region. Even if the mountains of New Guinea should exhibit any Australian character in their vegetation, it would be more probably exemplified in Proteaceæ, Myrtaceæ, and other woody orders now common to New Caledonia and Australia than in the herbaceous Compositæ.

5. *South-African Region.*

This may be generally described as extratropical South Africa, although we are not in a position to assign to it any precise limits to the northward. In the west it may be naturally bounded by the dry deserts assigned by Grisebach to the Kalahari region, which appear to be unfavourable to the development or extension of Compositæ. Eastward a few of the southern genera seem to penetrate further north, intermixing with the tropical genera, and represented by some species even in Abyssinia; but these are so few in comparison with their strictly South-African congeners, that the region is better defined, and the Composite statistics, owing to the recent elaboration of the order by Harvey in the 'Flora Capensis,' better established, than in almost any other region.

As the tropical-Asiatic is the poorest, so is the South-African, in proportion to its extent, at once the richest and the most diversified of all our regions, and the genera and species more universally endemic than in any other except insular ones. Above 100 out of 149 genera (that is, above two thirds) are strictly endemic, or at most have a single species penetrating into tropical Africa; and out of 1400 species, if we deduct a very few, like *Denekia capensis*, which cross the frontier to the north, there are not, as far as I can estimate, above a dozen common to other regions; and these are chiefly widely spread weeds, such as *Bidens leucantha*, *Eclipta alba*, *Siegesbeckia orientalis*, *Sonchus arvensis*, &c. The number of species to a genus is often also very large in endemic genera as well as in others which have a wide range in the Old World. *Pteronia*, *Felicia*, *Athanasia*, *Othonna*, *Ursinia*, *Berkheya* have each from forty to eighty species; many others vary from ten to near forty; *Helichrysum* has 137, and *Senecio* 190; so that, notwithstanding the number of well-marked monotypes or oligotypes, the average of species to a genus is very nearly ten, an average which exceeds that of the well-developed, but comparatively little diversified, Composite flora of the Europæo-Asiatic, and is only surpassed by that of the Mediterranean region.

One of the most striking features in the South-African Compositæ is the perfect isolation of many of the above-mentioned monotypic or small genera. *Corymbicum*, *Brachylæna* cum *Tarchonantho*, *Denekia*, *Œdera*, *Cadiscus*, *Eriocephalus*, *Lasiospermum*, *Eumorphia*, *Alciope*, *Lopholæna*, *Platycarpha*, *Anisochæta*, *Oldenburgia*, &c. have but a distant affinity with their cotribuals, or, rather, as I should say of many of them, with the genera with which they are technically associated. They may all be considered as the expiring remnants of long-lost races; but whether of races which have been differentiated, have grown flourished and gradually been worn out in the region itself, or of races once ranging widely over adjoining regions which have there been generally destroyed by physical or other changes, but have left these few outlying survivors in situations where they have met with protection from such general causes of destruction, is a question for the solution of which we may as yet have no data.

The prevailing tribes are, in the first place, those marked by the two large above-mentioned genera *Senecio* and *Helichrysum*, the Senecionideæ and the Gnaphalioid Inuloideæ; in the next place, the almost endemic Arctotideæ, then the Anthemideæ, Asteroideæ, radiate Inuloideæ, and Calendulaceæ, all the above being either essentially Old-World or cosmopolitan tribes. There are also more Mutisiaceæ, a southern tribe, than in any other Old-World region, as well as several Vernoniaceæ of an Old-World character or as isolated oligotypes. The Cichoriaceæ in which the Mediterranean region is so rich, are here very scantily represented; and the Cynaroideæ, still more characteristic of that region, are wholly absent. The American Eupatoriaceæ, Helianthoideæ, and Helenioideæ are also represented by very few species only, the Helenioideæ by a single isolated monotype (*Cadiscus*).

There does not appear to be so great a contrast between the eastern and western districts of the region in Compositæ as in Ericaceæ and several other more shrubby orders.

There are probably still many species or even genera to be discovered in the South-African region, although in the least-known parts, those bordering on the northern limits, Compositæ certainly diminish rapidly in numbers in proportion to other plants. The disproportionate numbers of the South-African and tropical-African Compositæ may probably, therefore, be somewhat modified by future researches; but it is expected that their highly diversified character in both regions will only be further confirmed.

6. *Australian Region.*

The insular character of the Australian territory renders it needless to say any thing of the delimitation of the region as to its Compositæ, beyond noting that it should include Tasmania. I do not, however, for the present purpose, extend it to Australasia generally, so as to comprise New Zealand; for the vegetation of that group of islands has in many respects either a peculiar or a more Antarctic character, and will be considered under the head of Insular Regions.

Although the Composite flora of Australia is considerable, with a fair proportion of endemic genera, these are neither so numerous, nor so isolated, nor yet so diversified as those of the much smaller South-African region. The total number of known species (497) is but little more than one third of the South-African, that of the genera altogether (89) rather more than half as many, but of the endemic genera (39) not so much as two fifths as many as those of South Africa; and, notwithstanding the rather high figure at which stand *Helichrysum*, *Olearia*, and a few others, the general average of species is scarcely above five, instead of nearly ten, to a genus. Very few of the endemic genera are really anomalous; most of them are nearly connected with South-African, South-American, or tropical-Asiatic types.

Only one subtribe is nearly endemic, the Angiantheæ belonging to Inuloideæ; it represents, as it were, the Filagineæ of other regions, but in many respects is more nearly connected with the *Helichrysum* group; and even this subtribe has one South-African representative, *Eriosphæra*, whilst the tropical-Asiatic *Cæsulia* and the South-American *Leucopholis* are, or might be, technically added to the Angiantheæ, although perhaps not joined very closely by natural affinity. Among the other endemic genera, the most distinct are perhaps *Thespidium*, *Coleocoma*, *Nablonium*, *Elachanthus*, and *Isoëtopsis*, all monotypes, but none so far removed from all allies as many of the above-enumerated South-African ones. There is, indeed, in the Australian Compositæ but little of that singularity which has been observed in so many other orders of plants as well as in animals. We might perhaps be disposed to attribute this to the supposed less remote antiquity of the order.

The principal characteristic tribes in the region are the Gnaphalioid Inuloideæ, related to *Helichrysum* and partaking more or less of a South-African character, the Asteroideæ, and Cotuloid Anthemideæ, connected sometimes with extratropical South-Ame-American or Andine, sometimes with South-African types, and the cosmopolitan Senecionideæ, each of these tribes having established a few Australian endemic genera or sections. Some Helianthoideæ and the very few Vernoniaceæ belong to the tropical-Asiatic connexion. Six tribes (Eupatoriaceæ, Helenioideæ, Arctotideæ, Cynaroideæ, Mutisiaceæ, and Cichoriaceæ) are represented only by single or exceedingly few species, either identical with or closely allied to those of other regions, with the exception perhaps of *Cymbonotus*, the sole representative of the South-African Arctotideæ, and, although closely connected with them, yet sufficiently marked to be generally admitted as an endemic monotype. Calendulaceæ have no such Australian representative, although, as above mentioned, they have one in Antarctic America.

Another great contrast of the Australian (insular) Compositæ as compared with the South-African (continental) ones is derived from the fact that fifty-eight out of nearly five hundred (that is, above one tenth) of the species are common to other countries, instead of scarcely one in a hundred. Of these fifty-eight common species, ten are also in New Zealand, two in South America, twenty-eight in tropical Asia, five in the extratropical northern regions of the Old World, twelve are common tropical weeds, and only one is South-African, although in modern times several South-African Compositæ have shown a great aptitude to colonize in Australia.

The distribution of Compositæ within the Australian region, the non-identity of eastern and western races, the number, diversity, and distinctness of genera and species in the south-western districts, giving them a marked character as a centre of preservation of ancient races, the variability and confusion of specific forms in the Eastern States almost unexampled, except in New Zealand, showing a high state of specific luxuriance, now perhaps undergoing a process of differentiation, the evidences of an ancient engrafting of Antarctic races in the mountain-regions of Victoria and Tasmania, and of a less remote intrusion continued in recent times of Asiatic races in the northern and especially the north-eastern districts, are all questions of great interest, but requiring too much detail to be entered into on the present occasion. They cannot either be well treated in regard to Compositæ alone without regard to the general vegetation of the region. For the general consideration of this subject we require a complete Flora of Australia drawn up on a uniform standard. Although I am now far advanced in this work, having now completed Dicotyledons, it will yet take me two or three years to reach the end. Should life be so long spared to me, it is to be feared that age would then interfere with my working out satisfactorily the necessary comprehensive considerations, which, indeed, would be much better placed in the hands of those who have acquired a personal knowledge of the country.

7. *Connexions between distant Old-World Regions.*

As in America, these are chiefly between north and south, but with rather more complication. The great Old-World continent, although nearly double the breadth of America, has no more than that continent any two distinct and distant east and west regions or endemic centres of Compositæ; it has not even any north and south chain of mountains to interrupt by a climatological barrier the gradual east and west extension or modification of races. On the other hand, the independent position of Australia establishes a break, unconnected with climate, not observable in America. We have therefore to consider, besides the connexions between the Mediterranean or Europæo-Asiatic regions on the one hand, and the South-African on the other, the separate connexions of Australia with South Africa, with tropical Africa, and with tropical Asia.

1. *Connexion between the Mediterranean and the South-African Regions.*

This is very much less prominent than that between the Mexican and the Chilian regions. Identical species are very few, if any, besides colonists; and if we omit cosmopolitan genera or those generally distributed over the tropical as well as the temperate regions of the Old World, we have only the following nine genera repeated north and south of the intermediate tropical-African region:—

Nolletia ...	3	southern,	1	Algerine species.
Ifloga	7	„	1	East- and West-Mediterranean species.
Lasiopogon	1	„	1	East- Mediterranean species.
Leyssera ...	3	„	1	West-Mediterranean species.
Iphiona ...	3	„	10	Mediterranean and tropical species.
Pegolettia..	2	„	1	North-African subtropical species.
Geigera ...	8	„	2	„ „ „
Matricaria	10	„	12	Mediterranean and Europæo-Asiatic species.
Othonnopsis	5	„	3	North-African and Oriental species.

Compositæ, as already observed, do not appear to have formed part of that curious West-European flora, consisting in a great measure of repetitions or representations of South-African races, as exemplified in Ericæ, Genisteæ, Lobelias, &c. The connexion, such as it is, is rather East-African than Western. Several European Composite weeds have become quite naturalized in South Africa; whilst the South-African ones received in return are but very few, established in very restricted localities.

2. *Australian connexions with the Old World.*

First with South Africa. Besides the cosmopolitan genera *Senecio* and *Gnaphalium* and a few cosmopolitan or subtropical weeds, the following genera are common to the two regions:—

Brachycome...	36	Australian,	1	South-African species.
Helipterum...	30	„	12	„ „
Helichrysum.	52	„	137	„ „
Cassinia	13	„	1	„ „
Athrixia	5	„	6	„ „
Cotula	9	„	22	„ „

Although we have here only six characteristic genera common to Australia and South Africa, or seven if we include *Senecio*, which has 28 Australian and 190 South-African species, yet those seven form a very prominent feature in the Composite flora of both, constituting above a third of the total number of species in Australia and above a fourth in South Africa. There are no species (except such weeds as *Cotula coronopifolia*) identical in the two regions; but one in each of them of *Athrixia* and two or three of *Helipterum* and *Helichrysum* are very closely representative. Of *Cassinia*, the South-African species (*Rhynea*) belongs to a section not met with in Australia, but represented by four species in New Zealand. To these representative plants must be added *Cymbonotus*, an endemic Australian monotype of the very distinct tribe (scarcely more than a Linnean genus) Arctotideæ, which, besides this one species and a very few stragglers into tropical Africa, is exclusively South-African. This approximation of the Compositæ of Australia and South Africa may possibly date from times less ancient than those in which they established a communication between the New and the Old World; and it may even have been less remote than the period in which flourished the common parents of Australian and South-African Proteaceæ and Restiaceæ, or of Australian Epacrideæ and South-African Ericeæ; for it is exemplified not in tribes only, but also in identical genera and sections. On the other hand, the separation may be supposed to be either more distant in point of time or more complete physiologically than in the case of *Pelargonium*, *Nicotiana*, and others, where the specific divergence of Australian from South-African or South-American races may be said to have only commenced.

The connexion between Australia and tropical Africa exemplified in a few arborescent or large shrubby Cæsalpineæ, Mimoseæ, Malvaceæ, &c. (*Cassia*, *Erythrophlœum*, *Adansonia*, &c.) has no instance, as far as I am aware, in Compositæ, perhaps owing to the absence of arborescent forms. With tropical Asia the northern and north-eastern coasts of Australia are more nearly connected; and in many orders tropical Australia possesses common or endemic genera and species forming part of the general tropical Indo-Australian flora. In Compositæ these Australian representatives of the flora are few, owing to the general poverty of the order in that region. There is in tropical Australia only one endemic genus (*Pleurocarpæa*), which may be said to be the Australian representative of the peninsular Indian *Adenoon*. The two tropical Old-World genera *Epaltes* and *Chrysogonum* (*Moonia*) have, the former two, the latter three, Australian endemic species, without any common ones. *Blumea* has in Australia three endemic and four common Asiatic species, *Glossogyne* two endemic and one common species, *Centipeda* one endemic and one common species; and the ten Asiatic or general tropical genera, *Saussurea* (a Northern genus extending into tropical Asia), *Vernonia, Elephantopus, Adenostemma, Conyza, Sphæranthus, Siegesbeckia, Spilanthes, Enhydra,* and *Gynura,* have each one or two species in Australia identical with wide-spread Asiatic ones, without any endemic congeners. The connexion in these cases is geographically not a very widely dissevered one considering the comparative vicinity of Timor, where outlying representatives of many truly Australian races are to be found.

The singular and hitherto inexplicable connexion between Australia and the Mediterranean region exemplified in *Gypsophila, Nitraria, Trigonella,* and some other herbaceous genera has no example in Compositæ; for that of the *Leuzea australis,* Gaudich. (which we have now thought it better to transfer to the section *Rhaponticum* of *Centaurea*), may have passed through a different channel. The species nearest approaching to it is a Spanish one; but it is also allied in many respects to a small group of large-headed Centaureas represented by two species in Abyssinia, one in North America, and four or five in Chile; and this connexion may therefore be similar to that remote mountain connexion between Victoria and Tasmania, on the one hand, and the high northern regions on the other, observable in *Anemone, Arabis, Oxalis,* &c., but which is otherwise unknown in Compositæ.

Insular Regions.

The detached islands scattered over the ocean show each one or each group so much of an endemic character in their Compositæ, that they can scarcely in this respect be distributed into regions as Grisebach has attempted in a general way. It appears to me to be more instructive to consider them separately in the following order:—In the Pacific Ocean: 1, the Sandwich Islands; 2, the Galapagos; 3, Juan Fernandez, Masafuera, &c.; 4, the South-Sea Islands. In the Atlantic: 5, the Atlantic group (the Azores, Canaries, and Cape-Verd Islands); 6, St. Helena and Tristan d'Acunha. In the Indo-Australian seas: 7, the Mascarene islands (Madagascar, Mauritius, and Bourbon); 8, New Caledonia; and 9, New Zealand. In all, the general features of insular floras are more or less illustrated also by their Compositæ—viz. a large proportion of endemic genera and species with often a different combination and value of distinctive characters than in their nearest-allied continental races, and (in many of them) a general tendency to an arborescent development.

1. *The Sandwich Islands.*

The flora of these islands is now pretty fairly known and well worked up by Asa Gray, and after him by the late Horace Mann and by W. T. Brigham, from whose enumeration in the Memoirs of the Boston Society of Natural History, vol. i. pp. 528 & 535, the following data are taken* :—

Table 13. *Compositæ of the Sandwich Islands.*

Genera.	Species.	Connexions.
Adenostemma	*A. viscosum*, Forst.	Cosmopolitan (colonist ?).
Ageratum	*A. mexicanum*, Linn.	Cosmopolitan (colonist ?).
Lagenophora	1 endemic species.	South extratropical American and Old-World.
Aster	1 endemic species.	
Tetramolopium (endemic)	6 endemic species.	South extratropical American rather than Old-World.
Vittadinia	1 endemic species.	South extratropical American and Australian.
Gnaphalium	*G. luteo-album*, Linn.	Cosmopolitan (colonist ?).
Coreopsis (Campylotheca, endemic section).	6 endemic species.	*Coreopsis* and *Bidens*, chiefly the tropical-American and the very few Old-World species.
Bidens	1 endemic species.	The tropical-American species
Lipochæta (endemic, except Galapagos).	10 endemic species.	Wedelioid Helianthoideæ, chiefly American.
Argyroxiphium (endemic)	2 endemic species.	Madieæ of the Mexican region.
Wilkesia (endemic)	1 endemic species.	Madieæ of the Mexican region.
Dubautia (endemic)	3 endemic species.	Madieæ and Galinsogeæ of the Mexican region, the nearest but distant.
Raillardia (endemic)	11 endemic species.	*Raillardella* of the Mexican region.
Hesperomannia (endemic)	1 endemic species.	*Stifftia* and *Wunderlichia* of the Brazilian region.
Sonchus	*S. oleraceus*, Linn.	Cosmopolitan (colonist ?).
16 genera, of which 12 endemic.	48 species, of which 45 endemic.	Generally American, but also in some measure Old-World, through Australasia.

In considering the above relations we must omit the four cosmopolitan species; for, whether they be really of modern or ancient introduction with or without the intervention of man, their presence may be accounted for by means of dispersion actually in force. The remaining forty-five species are all strictly endemic, showing that the ancient connexion, of whatever nature it may have been, with America on the one hand or with Australasia on the other, has been so long severed as not to have left a single unmodified common form. The species are all either descendants altered by long isolation or possibly, in some instances, preserved remnants of types long since extinct elsewhere.

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* Since these Tables have been made out the collections of Hillebrand have added one endemic genus and two or three endemic species to the Sandwich-Island Compositæ.

2. *Galapagos Islands.*

The flora of these islands is as well known as that of the Sandwich Islands, and has been well illustrated by Hooker and after him by Anderssen. The following data are taken from his "Vegetation of the Galapagos" in the 'Fregatten Eugenies Resa,' p. 65, with some slight modifications resulting from the researches of A. Gray and Hooker:—

Table 14. *Compositæ of the Galapagos Islands.*

Genera.	Endemic species.	Total.	Connexions.
Ageratum	...	2	American, chiefly Mexican.
Haplopappus	1	1	North-American, Mexican, and United States.
Erigeron	2?	2	American, nearest to western types.
Baccharis	1	2	American.
Elvira (endemic section)	2	2	American, Mexican, and tropical, chiefly western.
Lecocarpus (endemic)	1	1	Melampodium, American, chiefly Mexican.
Jægeria	2	2	American, chiefly Mexican and Andine.
Scalesia (endemic)	10	10	Mirasolia and other central-American Wedelioid Helianthoideæ.
Blainvillea	1	1	American, Mexican, more Brazilian and Andine.
Wedelia	1	2	American, chiefly Brazilian and Andine.
Lipochæta	1	1	Sandwich-Island congeners, with American allies.
Encelia	1	1	American, chiefly Mexican.
Spilanthes	...	2	Cosmopolitan (tropical and subtropical).
Chrysanthellum	1	1	Cosmopolitan (tropical).
Hemizonia	1	1	American, Mexican.
Flaveria	...	1	American, chiefly Mexican.
Porophyllum	1	1	American, tropical and subtropical, chiefly Mexican.
Pectis	1	5	American, Mexican, Andine, and Brazilian.
18 genera.	27	38	

The Galapagos, so much nearer to the American coast than the Sandwich Islands, are also much more decidedly American in the character of their Compositæ, although their affinity seems to be rather with those of Central America than of the more immediately opposite coast of Ecuador. A large proportion of the species are above shown to be endemic, the eleven common to America being chiefly weeds of cultivation or maritime plants capable of wide dispersion by present means, or species which for other reasons have an extended American area. Among the endemic species the majority are also slight modifications of extreme western or maritime Central-American or Mexican forms; and those which have been proposed (and some of them maintained) as independent endemic genera are not nearly so distinct as such Sandwich-Island ones as *Argyroxiphium*, *Wilkesia*, *Dubautia*, and *Hesperomannia*. *Desmocephalum* and *Micrococcia* are included by us in the Central-American *Elvira*; *Lecocarpus* and *Scalesia* might without difficulty have been referred to *Melampodium* and *Mirasolia* respectively as sections; *Macræa*, reduced by A. Gray to the Sandwich-Island *Lipochæta*, is also very near to the American *Wedeliæ*. None of the Galapagos Compositæ show any tendency to the arborescent forms observable in the more isolated insular groups.

3. *Juan Fernandez, Masafuera, San Ambrosio, and San Felix.*

The flora of these islands, lying some four or five hundred miles off the coast of Chile, has been only incidentally mentioned in treating of the plants of the Chilian region, and I can find no separate enumeration of the plants they contain; but the few Compositæ recorded are strongly characteristic of their long isolation. Juan Fernandez possesses twelve species belonging to the endemic genera *Robinsonia*, *Balbisia*, and *Dendroseris*, all arborescent or shrubby, and an endemic species of *Erigeron* with an exceptionally shrubby habit and some other slight characters which might justify the adoption for it of Colla's genus *Terranea*. The two first-named genera belong to the cosmopolitan tribe Senecionideæ, largely represented in extratropical South America, but with a very remarkable character of which only faint traces are to be met with in a very few other species of the whole order. The cotyledons in most (but not all) of the species are folded longitudinally or undulate. The third genus, *Dendroseris*, is a very exceptional arborescent Cichoriacea allied only to the rare *Fitchia* of the South-Sea Islands. These two genera, technically placed amongst Cichoriaceæ, have so little of the habit and characters of that tribe, except their peculiar corollas, that one cannot but conjecture that their departure from or connexion with the Mutisiaceous type must have been quite independent of that of the Old-World Cichoriaceæ.

Masafuera is known to possess at least one of the Juan-Fernandez *Dendroserides.* San Ambrosio and San Felix were visited in 1869 by Commander Simpson, of the Chilian vessel of war 'Chacabuco,' who brought some specimens of the vegetation in a very bad state to Philippi, who has published them in the 'Botanische Zeitung' for 1870, p. 496. He mentions one Composita, which he proposes as a distinct genus, differing from the South-American *Alomiæ* by having paleæ on the receptacle, a character which can scarcely be admitted as sufficient considering its variability in some nearly allied genera. It is, however, judging from Philippi's description, evidently a distinct endemic species. A plant of which he has seen the foliage only appears to him to be very probably an additional species of the Juan-Fernandez *Dendroseris.*

4. *South-Sea Islands.*

The islands of the South Pacific, from the Feejees to the Marquesas, have generally, in respect of Compositæ, the same character of extreme poverty observable in South-east Asia and the Archipelago. Scarcely twenty species are enumerated in the few works treating of their flora, the principal ones of which are Endlicher's 'Enumeration,' Guillemin's 'Zephrytis Taitiensis,' some of Asa Gray's papers on the plants of the American Exploring Expedition, and, still more recently, Seemann's 'Flora Vitiensis.' These twenty species include the weeds to be met with in almost all tropical and subtropical lists—*Adenostemma viscosum*, *Ageratum conyzoides*, *Erigeron linifolium*, *Siegesbeckia orientalis*, *Eclipta alba*, *Bidens pilosa*, *Centipeda orbicularis*, and *Sonchus asper.* There are also a *Vernonia* (*Cyanopis*), a *Blumea*, a *Wedelia* (*Wollastonia*), and a *Dichrocephala*, belonging to the flora of the Indian archipelago and tropical Asia. Four species are described as endemic in the Fiji or in the Tonga islands—a *Vernonia* (*Strobocalyx*), a *Blumea*, figured by Seemann, both requiring, perhaps, some further comparison with Archipelago species, a *Lagenophora*, and a *Glossogyne*, perhaps both of them also in New Caledonia. There are also two species of *Bidens* described as endemic in the Society Islands, and allied to some of the Sandwich-Island species of *Bidens* or *Coreopsis.* Lastly, there is the very remarkable *Fitchia*, found once only, I believe, in each of two different South-Sea Islands, and systematically connected with none but the Juan-Fernandez *Dendroseris*, mentioned under the last head. Of the whole nineteen or twenty Compositæ this will probably prove to be the only one presenting a remnant of an ancient flora, the only exception to the more or less adventitious character of the remainder.

5. *Atlantic Islands.*

Under this head are included the Azores, Madeira, the Canary Islands, and the Cape-Verd Islands. Their flora has been well investigated; and there are probably but very few species that have escaped notice, although there is much to be learnt yet as to the limits of variation which the native species have undergone, and different botanists have from the same materials very variously estimated the numbers of the principal genera, such as *Chrysanthemum*, *Senecio*, *Sonchus*, *Tolpis*, &c. The following Tables are deduced from data supplied by Seubert's 'Flora Azorica,' Webb's 'Phytographia Canariensis' worked up as to Compositæ by Schultz Bipontinus, Lowe's 'Flora of Madeira,' and Webb's 'Spicilegia Gorgonea' inserted in Hooker's 'Niger Flora,' with a few modifications, chiefly reductions of species, suggested by the specimens preserved in the Kew herbaria. As a general result, these islands, in respect of Compositæ, may be considered as an outlying district of the rich Mediterranean region, with a very slight tendency in a few Canary forms to a South-African type, without, however, any identical or even representative species, and in the most southern, the Cape-Verd group, an admixture of a few genera or species belonging to the neighbouring tropical African continent. More of the introduced species are here admitted than in the Tables of Continental distribution; for in islands introduced plants sometimes form so essential a part in the vegetation that they are inserted without remark in the local floras, and I have not been always able to distinguish them from more ancient inhabitants. I have, however, omitted such evident escapes from gardens as *Tagetes* and *Zinnia*.

Table 15. *Distribution of Compositæ in the Atlantic Islands.*

Genera.	Species.					Area of genera and observations.
	Azores.	Madeira.	Canary.	Cape-Verd.	Endemic.	
Vernonia	...	...	...	1	...	Introduced (American).
Ageratum	...	1	...	...	...	Introduced (tropical weed).
Eupatorium	...	1	...	...	...	Introduced (American).
Solidago	1	...	...	...	...	Introduced ? (American).
Bellis	1	1	1	...	1	Europe, Mediterranean.
Erigeron	1	2	1	1	1	Cosmopolitan.
Conyza	...	...	1	1	1	Cosmopolitan (tropical or subtropical).
Laggera ?	...	...	...	1	1 ?	African.
Pluchea	...	...	...	1	1 ?	African section.
Evax	...	...	1	...	...	Mediterranean.
Filago	2	3	2	...	...	Europæo-Asiatic and Mediterranean.
Ifloga	...	...	1	...	...	Mediterranean species, the genus also South-African.
Phagnalon	...	3	4	2	5	Mediterranean.
Gnaphalium	2	2	1	2	1	Cosmopolitan.
Helichrysum	...	3	2	...	2	Old-World, chiefly South-African.
Inula	...	1	2	1	2	Europæo-Asiatic, Mediterranean, African tropical.
Allagopappus	...	...	1	...	1	Endemic genus } *Inula* connexion.
Vieræa	...	...	1	...	1	Endemic genus } *Inula* connexion.
Pegolettia	...	...	...	1	...	Tropical and South-African.
Pulicaria	...	...	2	1	...	Mediterranean.
Odontospermum	...	1	5	1	3	Mediterranean.
Pallenis	...	...	1	...	...	Mediterranean.
Xanthium	...	1	1	...	...	Introduced (from Europe ?).
Ambrosia	...	1	...	...	...	Introduced ? (American) (maritime).
Siegesbeckia	...	...	1	...	...	Tropical weed.
Eclipta	...	1	...	...	...	Tropical weed.
Sclerocarpus	...	...	...	1	...	African and American, tropical and subtropical.
Blainvillea	...	...	...	1	...	Tropical weed.
Bidens	1	1	1	2	...	Tropical and subtropical weeds.
Gonospermum	...	...	4	...	4	Endemic genus; connexion between South Africa and Mediterranean.
Anacyclus	...	...	1	...	...	Mediterranean.
Achillea	...	2	...	...	...	Europe, Mediterranean.
Santolina	1	...	...	...	...	Mediterranean.
Diotis	...	...	1	...	...	Mediterranean, Europe, Africa (maritime).
Anthemis	2	2	2	...	...	Europæo-Asiatic, Mediterranean.
Chrysanthemum	...	6	9	4	7	Old-World, chiefly Mediterranean, one section endemic.
Matricaria	...	...	1	...	...	Temperate and subtropical weed.
Carried forward	11	32	47	21	31	

Genera.	Species.					Area of genera and observations.
	Azores.	Madeira.	Canary.	Cape-Verd.	Endemic.	
Brought forward...	11	32	47	21	31	
Cotula	...	1	...	...	...	Introduced ? Europe and South Africa.
Soliva	...	1	...	...	...	Introduced (American).
Artemisia	1	1	3	...	2	North temperate and subtropical Old-World and America.
Senecio	...	5	14	2	14	Cosmopolitan.
Calendula	...	2	1	1	1	West-Mediterranean, Africa.
Carlina	...	1	2	...	2	Mediterranean (endemic section).
Atractylis	...	...	2	...	1	Mediterranean.
Arctium	...	1	...	...	...	Introduced ? (Europe).
Carduus	...	2	3	1	2	Mediterranean, Europæo-Asiatic.
Cnicus	...	2	1	1	1	Mediterranean, Europæo-Asiatic.
Cynara	...	1	1	...	...	Introduced ? (Mediterranean).
Silybum	...	1	1	...	...	Mediterranean, Europæo-Asiatic.
Galactites	...	1	1	...	...	Mediterranean.
Volutarella	...	...	1	...	...	Mediterranean.
Centaurea	1	5	7	1	6	Europæo-Asiatic, Mediterranean, North-African.
Carthamus	...	2	2	...	...	Mediterranean.
Carduncellus	..	1	1	...	...	Mediterranean.
Scolymus	...	1	2	...	...	Mediterranean.
Cichorium	...	1	1	1	...	Introduced ? (Mediterranean &c.).
Tolpis	2	3	3	2	5	Mediterranean.
Lapsana	...	1	1	...	...	Old-World weed.
Rhagadiolus	...	1	2	...	...	Mediterranean.
Picris	...	1	2	3	2	Mediterranean (one Old-World weed).
Crepis	...	4	4	1	4	Europæo-Asiatic, Mediterranean.
Andryala	...	2	1	...	1	West-Mediterranean.
Hypochœris	...	2	1	1	...	Old-World weed.
Leontodon	...	1	1	1	...	Europæo-Asiatic, Mediterranean.
Taraxacum	...	1	1	...	...	Old-World weed.
Lactuca	...	1	1	...	...	Europæo-Asiatic, Mediterranean.
Prenanthes	...	...	1	...	1	Europæo-Asiatic, Mediterranean.
Picridium	...	...	3	...	2	Mediterranean.
Sonchus	1	4	13	1	14	Europæo-Asiatic, Mediterranean (one Old-World weed).
Microrhynchus	3	...	1	...	2	Mediterranean, African tropical.
Tragopogon	...	1	2	...	...	Mediterranean, Europæo-Asiatic.
Urospermum	1	1	1	1	...	Mediterranean.
Scorzonera	...	...	1	...	...	Europæo-Asiatic, Mediterranean.
Total	20	84	129	38	91	

From the above list must be deducted five genera, *Vernonia*, *Ageratum*, *Eupatorium*, *Solidago*, and *Soliva*, containing each a single species introduced from America. Five more, *Xanthium*, *Ambrosia*, *Siegesbeckia*, *Eclipta*, and *Bidens*, are widely spread weeds of an

American character, but common also in the Old World. Two also of the three or four species of *Erigeron* and one of the four or five *Helichrysa* are colonists only, the former of American, the latter of South-African origin. There remain sixty-three genera, comprising about 180 species, which may be regarded as indigenous. Amongst these there are three genera (all Canarian), and about ninety species (or half the total number) belonging to thirty genera, apparently endemic, the character of which we will consider under the separate groups of islands. Of the sixty apparently indigenous genera not confined to the Atlantic islands, five (*Laggera*, *Pluchea*, *Pegolettia*, *Sclerocarpus*, and *Blainvillea*, all from the southern Cape-Verd group) are African, but not at all, or scarcely, Mediterranean; the remaining fifty-five are all either essentially of a Mediterranean character, or are widely spread, or even cosmopolitan genera well represented in the Mediterranean region.

The Azores, the most northern of these groups, appear to have only twenty Compositæ, natives or colonists, the natives all Mediterranean species, except five belonging to the genera *Bellis*, *Tolpis*, *Sonchus*, and *Microrhynchus*, all chiefly or exclusively Mediterranean. Seubert enumerates seven endemic Compositæ; but the *Solidago azorica*, Seub., which is said to form so striking a feature on the sea-coast, is evidently the same as *S. mexicana*, Linn., a maritime plant from the southern coasts of North America, which must be regarded as a colonist in the Azores, although we may have no evidence as to the time or mode of its introduction. It is also believed that Seubert's *Tolpis nobilis* is only a luxuriant large-flowered form of *T. macrorhiza*, DC., from Madeira.

The Canary Islands with Madeira exhibit rather more of the insular character. Out of about 150 species of Compositæ, one half are endemic. Only three genera have that character; but to these might be added the endemic sections *Argyranthemum* of *Chrysanthemum*, *Pericallis* and *Bethencourtia* of *Senecio*, *Clavena* of *Carduus*, *Carlowitzia* of *Carlina*, and *Atractylis Preauxii*, which are all endemic groups of higher than specific value. There are tracts of country within the Mediterranean region, perhaps not of much greater extent, where an equal number of endemic races might be found, but never any thing near so large a proportion, the total number of Compositæ being everywhere much greater than those of the Canary Islands.

The above endemic genera are closely connected with, as the endemic sections and species belong to, Mediterranean genera, with a slight tendency to South-African forms in the genus *Gonospermum* and in some of the species of *Helichrysum* and *Chrysanthemum* and perhaps of *Senecio*. The insular tendency to a more shrubby form than their continental congeners or allies is also exhibited in *Allagopappus*, *Vieræa*, *Gonospermum*, *Chrysanthemum*, *Senecio*, and *Sonchus*; but there is nothing of the arborescent or highly differentiated character of the *Petrobium* of St. Helena, of the *Dendroseris* and others of Juan Fernandez, or of the *Fitchia* of the South-Sea Islands. There are none even of the locally restricted genetically isolated monotypes or small races of which we have noticed so many in the Mediterranean and South-African regions.

The Cape-Verd group has still less of the insular feature in its Compositæ; and the order is so little characteristic of its general vegetation, that it would be unfair to deduce from them any general considerations. The total number is only thirty-eight, including several widely spread Mediterranean species which may prove to be modern colonists. There are no endemic genera or sections; and the few apparently endemic species are of an African character, and may yet be found on the opposite continental coast, although the distance be as great as that which separates the Canary Islands from the opposite mainland.

6. *St. Helena and Tristan d'Acunha.*

The expiring flora of the isle of St. Helena is as remarkable in Compositæ, as in other orders, in its distant connexions. Although nearer to Africa than to any other continent, those Composite denizens which bear evidence of the greatest antiquity have their affinities for the most part in South America, whilst the colonists of a more recent character are South-African. Seven endemic species are known—*Commidendron* four species, *Melanodendron*, *Petrobium*, and *Psiadia*, one each. All, except one species of *Commidendron*, have more or less of the insular arborescent character. *Commidendron* and *Melanodendron* are among the woody Asteroid forms exemplified in the Antarctic-American *Chiliotrichium*, in the Andine *Diplostephium*, and in the Australasian *Olearia*. *Petrobium* is one of three genera, remains of a group probably of great antiquity, of which the two others are *Po-*

danthus in Chile and *Astemma* in the Andes. The *Psiadia* is an endemic species of a genus otherwise Mascarene or of eastern Africa, presenting a geographical connexion analogous to that of the St.-Helena *Melhaniæ* of De Candolle with the Mascarene *Trochetia*.

The remaining Compositæ of the island are species belonging to other countries, and especially South-African. How far they have been introduced in modern times through the agency, direct or indirect, of man, or how far they may be ancient colonists brought to the island by currents, birds, or other causes still in operation or whose action may have ceased, it will perhaps not be possible to determine. The following are those which are said to be well established:—*Gnaphalium indicum* and *G. sylvaticum* ?, *Cotula coronopifolia* and *C. australis*, *Siegesbeckia orientalis*, *Eclipta alba*, *Senecio vulgaris* and *S. sylvaticus*, *Osteospermum moniliferum*, *Hypochœris radicata* and *H. glabra*, and *Sonchus oleraceus*, besides an *Oligocarpus*, which I have been unable to match with the known species, but may yet very likely be found in South Africa with its congeners. Several planted trees, also from various countries, thrive so as to appear wild.

Our knowledge of the plants of Tristan d'Acunha is derived from Dupetit Thouars's Flora of the island in his 'Mélanges,' supplemented by Captain Carmichael in the 12th volume of the Linnean Transactions. He enumerates four Compositæ, of which two, *Chevreulia stolonifera* and *Lagenophora Commersonii*, growing sparingly on the most barren exposed rocks, are Antarctic South-American plants; the other two are weeds of the cleared grounds —one the cosmopolitan *Sonchus oleraceus*; the other *Gnaphalium pyramidale*, Thou., is described as endemic, which, however, is not probable. I know not where any specimen may be preserved to determine the point.

7. *Mascarene Islands.*

The Composite flora of Madagascar, Mauritius, and Bourbon is of high interest in a phytogeographical point of view, from its evident connexion with the most ancient types of the African continent. Unfortunately it is as yet too little known to found upon it any satisfactory conclusions. The following data are gleaned from De Candolle's 'Prodromus,' and from such specimens as are preserved in the Kew herbarium. It is probable that many additions might be made from a careful scrutiny of the herbarium of the Jardin des Plantes at Paris, and that much remains yet to be discovered in the interior of Madagascar.

Table 16. *Compositæ of the Mascarene Islands.*

Genera.	Endemic species.	Total.	Connexions.
Vernonia	6	7	African.
Centauropsis	2	2	Asiatic *Adenoon*, Australian *Pleurocarpæa*.
Adenostemma	...	1	Tropical weed.
Ageratum	...	1	Tropical weed.
Rochonia	2	2	African and American homochromous Asteroideæ.
Glycideras	1	1	
Henricia	1	1	South-African *Felicia*? or Australian *Olearia*?
Conyza	5	5	Tropical regions generally.
Psiadia	16	16	Tropical-African.
Synchodendron	1	1	South-African.
Blumea	1	2	Tropical Africa and Asia.
Pluchea	1	2	Tropical Africa and Asia.
Sphæranthus	1	1	Tropical Africa and Asia.
Pterocaulon	1	1	South America, Australia, New Caledonia.
Monarrhenes	3	3	None very near.
Cylindrocline	1	1	
Demidium	1	1	Little known.
Gnaphalium	4	5	African.
Helichrysum	22	22	African and Australian.
Stenocline	16	16	South-American and somewhat African.
Syncephalum	1	1	African?
Stœbe	1	1	South-African.
Athrixia	2	2	African and Australian.
Printzia	1	1	African.
Sphacophyllum	1	1	African.
Bojeria	1	1	African.
Aspilia	2	2	African and South-American.
Epallage	2	2	South-American (and African?).
Micractis	1	1	African and South-American?
Centipeda	...	1	Tropical weed.
Eriothrix	1	1	None near.
Faujasia	3	3	African *Senecios*.
Gynura	2	3	African and Asiatic.
Emilia	3	4	Asiatic, 1 tropical weed.
Senecio	30	30	Cosmopolitan and somewhat specially African.
Crepis	1 (?)	2	Tropical weed.
Hieracium	1	1	African (1 species), Europæo-Asiatic, American, &c.
Lactuca	...	1	Asiatic.
Microrhynchus	1	2	Asiatic and African.
39 genera, of which 15 endemic.	139	151	1 African, 2 Asiatic, 3 Australian, 4 South-American.

The twelve species in the above list which are not endemic may all be regarded as common tropical Old-World weeds, with the exception, perhaps, of the *Pluchea* and the *Gynura* (*Cremocephalus*), which are African. The Composite flora is therefore almost as strictly endemic as that of the Sandwich Islands. It is also much diversified, with evidences of great antiquity. The genera *Synchodendron*, *Monarrhenes* cum *Cylindrocline*, *Syncephalum*, and especially *Eriothrix* are almost as isolated as any South-African ones. It further shows insular characteristics in another point, the tendency to a tall shrubby or arborescent form of several of the endemic or prevailing genera.

The connexions of the Mascarene endemic Compositæ are eminently with the southern and subtropical African races, especially those of Madagascar itself; the more tropical races, Plucheineæ &c., may be rather more of an Asiatic type. A slight Australian character is shown in *Centauropsis*, *Henricia*, *Pterocaulon*, *Helichrysum*, and *Athrixia*, the last two, and possibly *Henricia*, belonging to groups common to South Africa and Australia; the other two genera are more tropical; *Pterocaulon* is Australasian and South-American, but not Asiatic. *Centauropsis*, of two species, is represented only by two monotypes, *Adenoon* in the East-Indian peninsula and *Pleurocarpæa* in tropical Australia.

8. *New Caledonia.*

This island was not included above among those of the South Pacific on account of the rather more Australian character of its Compositæ. Its vegetable statistics, however, are very much in arrear. We have no New-Caledonian Flora; the rich materials accumulated of late years, especially in the Paris herbarium, have only been very partially worked up. Messrs. Brongniart and Gris have published chiefly the most remarkable among the shrubby and arborescent orders and genera, which, as the chief representatives of the ancient indigenous races, have of course the greatest interest in a phytogeographical point of view. The Compositæ have not been touched; and I am not aware that De Candolle's 'Prodromus' contains any more than the three species published by Labillardière in his 'Sertum.' On a hasty glance with Dr. Hooker some years since over the Parisian collection, it appeared to us that there were about thirty species of Compositæ, at least half of them widely spread weeds of the tropical-Asiatic or Indo-Australian region, including *Ageratum*, *Eclipta*, *Siegesbeckia*, *Xanthium*, &c. These were accompanied by a *Vittadinia*, two or three species of *Pterocaulon* (*Monenteles*), two or three of *Helichrysum* (or *Cassinia*?), one or two of *Gnaphalium*, a *Wedelia* (*Wollastonia*), and a *Glossogyne*, of which the three former genera have more of an Australian than an Asiatic character, the three latter belonging to both countries; and several of these species may prove to be endemic; but we saw nothing, nor have I met elsewhere with any specimen showing any probability of a New-Caledonian endemic genus of Compositæ, nor do I know of any species assuming an arborescent form. The New-Caledonian connexions with distant lands were probably of an earlier date than the general development and dispersion of Compositæ.

9. *New Zealand and neighbouring Antarctic Islands.*

The flora of these islands has been so well and so recently worked up by Hooker, that little need here be said beyond giving the following.

Table 17. *Compositæ of the New-Zealand group.*

Genera.	Endemic species.	Total species.	Connexions.
Lagenophora	3?	4	Indian archipelago, Australia, extratropical South America.
Brachycome	3	3	Australia, more remote South-African and Mediterranean.
Olearia	22	22	Australia, and less close *Chiliophyllium*, Antarctic South America.
Pleurophyllum	2	2	Endemic genus, allied to *Celmisia*.
Celmisia	24	25	Australia, and, less close, some Andine *Erigerons*.
Vittadinia	...	1	Australia, South-Pacific islands, and extratropical South America.
Haastia	3	3	Endemic genus, allied to none nearer than some Mascarene *Plucheas* or *Conyzas*.
Gnaphalium	5	8	Cosmopolitan, with forms specially Australian or Indian-archipelago.
Raoulia	12	12	Australia, and Australian *Gnaphalia* and *Helichrysa*.
Helichrysum	12	12	General Old World, with types, some endemic, some Australian, some northern.
Cassinia	4	4	Nearer to the South-African section *Rhynea* than to the Australian species.
Craspedia	1	2	Australia.
Bidens	...	1	Cosmopolitan weed.
Cotula	11	13	Australia and extratropical South America.
Centipeda	...	1	Cosmopolitan, tropical, and south extratropical weed.
Abrotanella	4	4	Australia and extratropical-South-American.
Erechthites	1	4	Australia and South-American.
Brachyglottis	1	1	Endemic, but allied to the cosmopolitan *Senecio*.
Senecio	20	21	Cosmopolitan, and no special New-Zealand section, the non-endemic species Australian.
Microseris	...	1	Australia and extratropical South and North America.
Picris	...	1	Cosmopolitan (colonist?).
Taraxacum	...	1	Cosmopolitan (colonist?).
Sonchus	1	2	One cosmopolitan (colonist?), the other very distinct.
23 genera, of which 3 endemic.	129	148	1 Australia, 2 extratropical-South America, 3 Indian archipelago and South-Pacific isles.

The usual endemic character of insular flora is shown by the above Table, although not so absolute as in several of the preceding insular groups. Of the fifteen species common to other lands eight (belonging to *Gnaphalium*, *Cotula*, *Bidens*, *Picris*, *Taraxacum*, and *Sonchus*) are widely spread weeds which may have been earlier or later received by means of transmission still in operation; the remaining seven are Australian, some of them extending also northwards to the Indian archipelago. The common genera with endemic species are also mostly Australian; several, however, are also in extratropical or Antarctic South America, the New-Zealand races forming, as it were, a connecting-link between the Australian and the Chilian regions. The three endemic New-Zealand genera are not very highly differentiated. *Brachyglottis* is near some forms of the cosmopolitan *Senecio*: *Pleurophyllum* and *Celmisia* (which last, the largest New-Zealand genus of Compositæ, is almost, but not quite, endemic) are nearly allied to some Andine forms of *Erigeron*. The Gnaphalioid group is the most exceptional in its relations; the endemic genus *Haastia* appears more nearly allied to those Mascarene species of *Psiadia* or *Conyza* upon which Cordemoy has founded his genus *Frappiera*, than to any other New-Zealand genus. The New-Zealand *Cassiniæ* have the characters of the South-African section *Rhynea*, rather than of the Australian typical *Cassiniæ*; and some of the *Helichrysum* forms have their nearest counterparts in some mountain-species of the distant Mediterranean region. *Sonchus*, another northern race, has one well-marked species endemic in New Zealand.

Some of the genera present highly developed shrubby species, but none so arborescent as in some of the preceding more perfectly isolated island groups.

D. COLONIZING COMPOSITÆ OR INTRODUCED SPECIES.

In Compositæ, as in other orders, there are a certain number of species which when carried through the agency of man, intentionally or unintentionally, into distant lands become there established, sometimes even to the exclusion of much of the native vegetation. We might, indeed, have expected in an order where there are apparently so many provisions for the dispersion of the seeds, and where we so frequently observe the greatest readiness in germination, that such colonization would be very extended. But when the list has to be made out, it is by no means a long one; such species appear to be fewer in proportion than in herbaceous Papilionaceæ, Labiateæ, and some other orders not endowed with any specially evident facilities for dispersion.

I cannot reckon above seventy species which have in recent times naturalized themselves in countries distant from their own. I must, however, acknowledge that the following lists may be very imperfect. It would require much more time than I have been able to bestow to glean the necessary data from the multitudinous publications in which they are noted, and still more to form a correct idea of the value of these data. Local botanists, and especially travelling collectors, rarely distinguish between a single apparently wild individual which may have been planted, or may have once or twice sprung up without further propagation and a well-established weed. These lists, however, such as they are, may be sufficient to found some considerations on the specific qualifications best suited for successful colonization, and which may be taken as supplementary to the elaborate treatment of the general subject in the second volume of A. De Candolle's 'Géographie Botanique,' more especially to the head of "Naturalisation à grande distance," p. 709.

We may, in the first place, distinguish escapes from cultivation and weeds of cultivation—the former being plants specially introduced by man for ornament or use, and which have spontaneously spread from the spots where he had planted them; the weeds of cultivation including all those which man had unintentionally transported, either mixed with the cultivated seeds or attached to goods transmitted, or with ballast, or other means connected with transmarine or terrestrial overland traffic.

Table 18. *Composite escapes from Cultivation.*

Species.	Where established.	Qualifications.
a. *of American origin.*		
Aster salignus	Marshes and wet places in many parts of Europe.	Pappus. Marsh-plant.
Aster Novi Belgii and a few others.	Europe, chiefly Germany, banks of streams.	Pappus; persistent root.
Solidago canadensis.........	Europe and some other temperate countries.	,, ,,
Zinnia, two or three species or varieties.	Atlantic islands, tropical and subtropical Africa and Asia.	Abundance of seed; ready germination?

Species.	Where established.	Qualifications.
a. *of American origin.*		
Coreopsis tinctoria	East India.	Abundance of seed; ready germination?
Gaillardia, sp.	East India.	
Cosmos sulphureus	East India.	
Tagetes erecta or Tagetes patula.	Atlantic islands, Africa, East India.	
b. *of European origin.*		
Inula Helenium	North America.	Pappus; persistent root.
Tanacetum vulgare	North America.	Abundance of seed; persistent root.
Artemisia Absinthium	North America.	Abundance of seed; persistent root.
Chrysanthemum coronarium and C. carinatum.	East India.	Abundance of seed and ready germination.
Matricaria Parthenium	North America.	Abundance of seed; persistent root.
Calendula officinalis	South Africa.	Ready germination; adherence.
Carthamus tinctorius	East India.	Vitality of seed? ready germination?
Tragopogon porrifolium	Australia.	Pappus; persistent root.

Of the above fourteen species or groups of species four or five only appear to be endowed with any special facilities for being carried beyond the limits of the gardens they had been cultivated in to localities suitable for their preservation. The remainder, apparently limited to the ordinary chances of transport, have either had those chances multiplied by their great fertility, or have been better able to avail themselves of them by some such qualifications as long-preserved vitality, external protection, hardiness or persistence when once established, &c., which may be more conveniently discussed under the following head of weeds of cultivation.

Table 19. *Composite weeds of cultivated and waste places of foreign origin.*

Species.	Where established.	Qualifications.
a. *of American origin.*		
Solidago mexicana	Atlantic Islands (Azores).	Pappus. Maritime plant.
Aster annuus	South and Central Europe, East India.	Pappus; abundance of seed.
Erigeron canadense	All temperate and warm countries.	Pappus; abundance of seed.

Species.	Where established.	Qualifications.
a. *of American origin.*		
Erigeron bonariense	Africa.	Pappus; abundance of seed.
Gnaphalium purpureum	East India, Australia.	Pappus; abundance of seed; adherence?
Lagascea mollis	Tropical Asia and Africa.	
Xanthium spinosum	Europe, East India, Australia.	Adherence, vitality, and protection of seed.
—— macrocarpum and allies.	Europe.	Adherence, vitality, and protection of seed.
Bidens pilosa and Bidens bipinnata.	Most warm countries.	Abundance of seed; adherence.
Synedrella nodiflora	East India.	
Galinsoga parviflora	Europe, East India, Australia.	Abundance of seed, ripening with corn.
Tridax procumbens	East India.	
Soliva	Portugal, Australia, Chili.	Adherence. Maritime plant.
b. *of European origin.*		
Filago germanica	North America.	Pappus; abundance of seed; adherence?
Anthemis Cotula	North America, Chili, Australia.	Abundance of seed, ripening with corn?
—— arvensis	North America, Chili.	Abundance of seed, ripening with corn?
Achillea ptarnicea	North America.	Persistent root.
—— millefolium	North America.	,, ,,
Matricaria Chamomilla	North America.	Abundance of seed, ripening with corn?
Chrysanthemum segetum	South Africa, Australia.	Abundance of seed, ripening with corn?
—— leucanthemum	North America, Chili.	Persistent root.
Tussilago Farfara	North America.	Pappus; persistent root.
Senecio vulgaris	North America, South Africa, Chili.	Pappus; abundance of seed.
Arctium Lappa	North America.	Adherence; vitality of seed.
Carduus marianus	Australia.	Pappus; vitality of seed?
Cnicus lanceolatus	North America, Australia, Chili.	,, ,, ,,
—— arvensis	North America, Chili.	Pappus; vitality of seed; persistent root.
Onopordon acanthium	North America, Australia.	Pappus; vitality of seed; persistent root?
Cynara Cardunculus	Extratropical South America, Australia.	Pappus; vitality of seed; persistent root.
Carthamus lanatus	South Africa.	Pappus; vitality of seed.
Centaurea nigra	North America.	Vitality of seed?
—— Cyanus	North America, South Africa.	Vitality of seed? ripening with corn.
—— solstitialis and melitensis.	North America, South Africa, Chili, Australia.	Adherence; vitality of seed? maritime habitat.
—— Calcitrapa	North America, Australia.	

Species.	Where established.	Qualifications.
b. *of European origin.*		
Carbenia benedicta	North America, South Africa, Chili.	Vitality of seed?
Lapsana communis	North America.	Abundance of seed.
Arnoseris pusilla	Tasmania.	,, ,,
Pieris hieracioides	Most temperate regions.	Pappus.
Leontodon autumnale	North America.	,,
—— hirtum	Australia.	,,
Hypochœris glabra	Most temperate regions.	,,
—— radicata	Australia.	,,
Taraxacum dens-leonis	Most temperate regions.	Pappus; persistent root.
Sonchus oleraceus	Most temperate and subtropical regions.	Pappus.
—— arvensis	North America.	,,
Lactuca saligna	Australia.	,,
Urospermum picroides	South Africa.	,,
c. *of South-African origin.*		
Helichrysum fœtidum	Atlantic Islands, West France.	,,
Cotula coronopifolia	Various temperate regions.	Maritime station.
Osteospermum moniliferum.	St. Helena.	Vitality of seed?
Cryptostemma calendulaceum.	Australia (South-west Europe?)	
Tripteris clandestina	Australia.	

To the above list might perhaps be added from the species common to the New and the Old World, Table 4, *Sparganophorus*, *Elephantopus*, *Adenostemma*, *Ageratum*, *Epaltes*, *Ambrosia*, *Siegesbeckia*, *Eclipta*, all probably colonists in the Old World from America, although perhaps previous to and independent of human traffic. We should then have about sixty Composite weeds carried by various causes, including the unintentional agency of man, to distant lands, and there naturalized, about $\frac{2}{3}$ per cent. of the total number of known Compositæ. It would be interesting to ascertain what are the special qualifications and properties which have enabled these few alone to profit by facilities which would seem to have been equally offered to a large proportion of the $99\frac{1}{3}$ per cent. which have remained within their own areas, or have only spread gradually and continuously. These qualifications or properties can, however, in many instances be but conjectural, and require much experimental investigation; and it may, moreover, in each case require a combination of many and varied peculiarities to ensure success.

First, as to means of transport. In the case of Compositæ a most obvious one to the casual observer is the pappus, enabling the seed* to be carried off by winds. But A. De Candolle, in his above-mentioned 'Géographie Botanique,' had already shown how inefficient this is for transport across seas; and his views have been fully confirmed by the observations of Kerner. The most violent winds will not carry them above two or three miles; the moment the pappus gets into a damper atmosphere it collapses, and when once the seed has fallen to the ground it is very rarely again raised by the wind. The most that the pappus does to assist the species in its migration is to carry the seed to a short distance from its parent and deposit it in running water, on bales of goods, on soil to be taken as ballast, or in other places where it has a chance of being carried further by other means. That the pappus, indeed, is really and solely a provision for the transport of the seed will scarcely be maintained when we consider, first, that in the great majority of more or less unisexual Compositæ the pappus is much more developed on the male or sterile achenes than on the female fertile ones, and that in a large number of Cynaroideæ, and even in many Cichoriaceæ, the pappus separates so readily from the achene that the down we see floating in such quantities over a field of thistles has, for the most part, left the achene enclosing the seed behind. So little, indeed, does the pappus really assist the emigration of species, that we find in the above list of sixty colonists only twenty-two or twenty-three, or but little above one third, possessing an available pappus; whilst in the total number of known Compositæ more than two thirds are so endowed.

Adherence to moving or moved objects by means of hooked points, spines, glutinous exudations, intricate scabrous-fibred wool, &c. is a well-known cause of the transport of Composite fruiting heads, and has so much assisted, for instance, the spread of *Xanthium* and other nuisances; but even that alone is not so frequent as is supposed. Some half a dozen only of the above list have adherent heads, a few more (*Bidens, Calendula, Adenostemma*) have adherent achenes; and adherence alone is quite insufficient. Many Composite burrs, such as *Acanthospermum*, have but a comparatively limited area. As in Boragineæ, the burr-nutted *Echinospermums* are, as a rule, much less generally diffused than the smooth-nutted *Myosotises*; so, in Compositæ, *Arctium lappa* migrates much less than *Cnicus arvensis*; *Calotises* have a more limited area than many *Brachycomes*.

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* I use the word "seed" here in the popular sense, which, in Compositæ, is the botanical achene, including the inseparable pericarp.

The ripening the seed at the same time as the corn or other cultivated seed-crop with which the plant has become mixed is a great assistance to the transport of cornfield-weeds, their seed being usually gathered, mixed, and carried with that of the cultivated plant. Cornfield-weeds, however, are not so numerous in Compositæ as in Papilionaceæ, Caryophylleæ, &c.: *Anthemis cotula* and *arvensis*, *Matricaria chamomilla*, *Chrysanthemum segetum*, and *Centaurea cyanus*, amongst the European ones, and the American *Galinsoga* are the principal ones; and perhaps some of the tropical weeds similarly deprived of any serviceable pappus, such as *Eclipta*, may owe their wide dissemination partly to their ripening their seeds with those of the cultivated crops.

The stations affected by certain species may be such as to place them specially within reach of means of transport, as, for instance, maritime plants, which are often carried out across seas to great distances, probably in some measure connected with navigation and commerce. In Compositæ *Solidago mexicana*, *Soliva*, *Cotula coronopifolia*, *Centaurea melitensis* and *calcitrapa* may owe their disjointed areas to this amongst other causes.

Great fertility, the very abundant production of small seeds, is most serviceable in multiplying the chances of some of them being seized upon by extraneous means of transport, as well as in establishing a plant when transported. This may be specially exemplified in the dispersion of annuals to short distances, as in the case of the annuals escaped from cultivation in table 18, and of the rapid establishment of *Ageratum*, *Erigeron canadense*, &c. when carried to great distances, as well as of the sudden appearance from nearer homes of such extraordinary numbers of *Blumeas*, *Conyzas*, *Erigerons*, *Senecios*, &c. in newly cleared ground or drained lakes.

Of the various other means of transport and facilities offered to plants fitted for availing themselves of them, commented upon by Alphonse De Candolle, Darwin, and others, no special instances calling for remark have occurred to me in Compositæ. It is not, however, enough for the seed to be carried to a new spot; when there, the seed and the plant to proceed from it must present qualifications and properties enabling them to germinate, grow, and multiply.

Ready germination is often highly serviceable. Small seeds arriving in great numbers have usually great obstacles to overcome, many enemies to contend with. If the physical and meteorological conditions of the soil they are deposited upon are not favourable at the time of their arrival, or if their germination is slow when the conditions are such as to produce it, the chances are that the seeds will have died or have been destroyed before they have fixed themselves in the soil. The rapid germination of small seeds is probably an essential condition of the above-mentioned sudden appearance of large numbers of *Blumeas* and others, and enables certain plants, which chance has thus brought, immediately to take almost exclusive possession of cleared grounds, fresh turned-up soil, drained lakes, &c., as in the case of the *Senecio* that covered the bed of the lake of Haarlem the first year after the water was drained off. Marsh and aquatic plants, when of ready germination, enjoy peculiar facilities for establishing themselves; for, as a rule, they find the physical conditions almost at all times and seasons equally favourable for their germination. These plants are rare in Compositæ; and a considerable proportion of those that are known (*Sparganophorus*, *Enhydra*, *Aster acris*, *A. salignus*, &c.) are amongst the widely dispersed or amphigeous plants or distant colonists. Ready germination is probably also an essential element in the spread of annual escapes from cultivation.

Where seeds are few or of slow germination, great vitality and external protection are most useful; and these, more even than the burr-like facilities for transport, have probably effected the noxious multiplication of the *Xanthiums*. Securely encased in a bony envelope, which may defy the efforts of most of its enemies to reach the scanty food within, the seed may await the occurrence of favourable conditions for germination, through successive seasons which would utterly destroy myriads of the smaller unprotected seeds. Similar causes may perhaps similarly facilitate the establishment of some of the *Centaureas*, which have usually but few good achenes enclosed in their hard prickly involucres.

But successful germination, however abundant, is not sufficient to establish a colonist if it has not among its inherent properties those which will enable it to hold its own against the numerous enemies which will attack it, the numerous rivals which will dispute the possession of the soil. Enormous reproduction is insufficient without individual tenacity of life. The *Senecios*, *Blumeas*, *Erigerons*, *Conyzas*, which may cover new ground and produce their seed a thousandfold, ten thousandfold, or more, may succumb in the course of a few years to the individually vigorous denizens that may gain a footing amongst them, in the same manner as we see vigorous foreigners (like *Cryptostemma* in

Australia and *Xanthiums* in South Europe) in certain situations smother out the native vegetation. *Xanthiums*, indeed, amongst annuals, and probably also *Erigeron canadense*, appear to possess this individual vitality to a very great degree. *Xanthium strumarium*, a great nuisance in the southern vineyards, on account of the disagreeable flavour it is supposed to or actually does impart to the wine, however carefully hoed up will, if left on the soil, most readily take root again and grow. But perennials with creeping roots or underground rhizomes capable of sending up shoots from any small portion left in the soil enjoy and avail themselves of this vitality in the highest degree; and this, much more than the supposed efficiency of the pappus, appears to be the great cause of the extension of such plants as *Tussilago farfara, Cnicus arvensis, Taraxacum dens-leonis*, &c.

The introduction and establishment of colonizing plant-races is now proceeding so rapidly, especially in new countries such as Australia, New Zealand, central and western North America, &c., and the attention of local naturalists is so generally called to it, that we must expect numerous observations in correction of many of the foregoing conjectures, and in elucidation of the theories of the changes which are now taking place, and have from time immemorial taken place, in the vegetation and plant-distribution over the surface of our globe.

CONCLUSION.

If, after summing up the data collected in the foregoing pages, we attempt any general conclusions as to the special fatherland of Compositæ, their original birth-place, the history of their migrations, and their present homes of predilection, all that we can put forward as plausible conjecture is:—that Africa, West America, and possibly Australia possessed the order at the earliest recognizable stage, Africa showing the greatest variety of individual isolated remnants of extinct races, Andine America and some of the scattered islands showing a few of what may be deemed the nearest approach to what we have conjectured to have been the primitive form of the order; that at this early period there must have been some means of reciprocal interchange of races between these regions; that, since the disruption of this intercourse between the two great divisions of the globe, there must have been for a time a certain continuity of Composite races across the tropics from south to north, a continuity which was probably further prolonged in America than in the Old World; that as Compositæ began to disappear from these tropical regions which thenceforth opposed to them impassable barriers, they became rapidly differentiated and multiplied both northward and southward, with greater structural divergences in the Old World than in the New, owing to the isolation being more complete in the former than in the latter; that those forms, those more or less differentiated races which had reached and accommodated themselves to high northern latitudes or mountain altitudes retained some means of communication and interchange between the Old and the New World long after it was broken off in the warmer parts of the globe; and that the homes where Compositæ now flourish in the greatest luxuriance of specific variety and individual numbers appear to be, tropical America exclusive of the great alluvial low grounds and forest regions, the United States, South Africa, the Mediterranean region, West Central Asia, and extra-tropical Australia.

The above paper had already been ordered for printing by the Council of the Linnean Society, and the corresponding portion of the 'Genera Plantarum' placed in the printer's hands, when I received from Mr. C. B. Clarke, who has for many years been studying on the spot the flora of Bengal, a detailed enumeration of the Compositæ of that province, with many valuable notes on their synonymy and on the circumscription of their genera and species. The views expressed in this paper so far coincided with those I had already entertained in working up the order, that I did not think it worth while to enter into the reexamination which would be necessary for a careful comparison; but as it was only fair to Mr. Clarke that he should have due credit for his investigations, I read his letter at a meeting of the Society, and applied to him for leave to print his observations as an appendix to the present notes. He has, however, observed in reply that his communication was only intended as an aid to me in working out the order, and not sufficiently matured for publication in its present form. Acknowledging, therefore, the full value of these critical notes, I have reserved them for the use of the editors of the new 'Flora Indica,' now, it is hoped, in a state of steady progress.

Note to Mr. Currey's paper on *Cunninghamia infundibulifera.*

Since the above paper was published, it has been suggested to me that the existence of the Coniferous genus *Cunninghamia* will prevent the adoption of that name for the Fungus which I have described, and I propose, therefore, to call the plant *Choanephora Cunninghamiana*[*].

[*] From χοάνη, a funnel.

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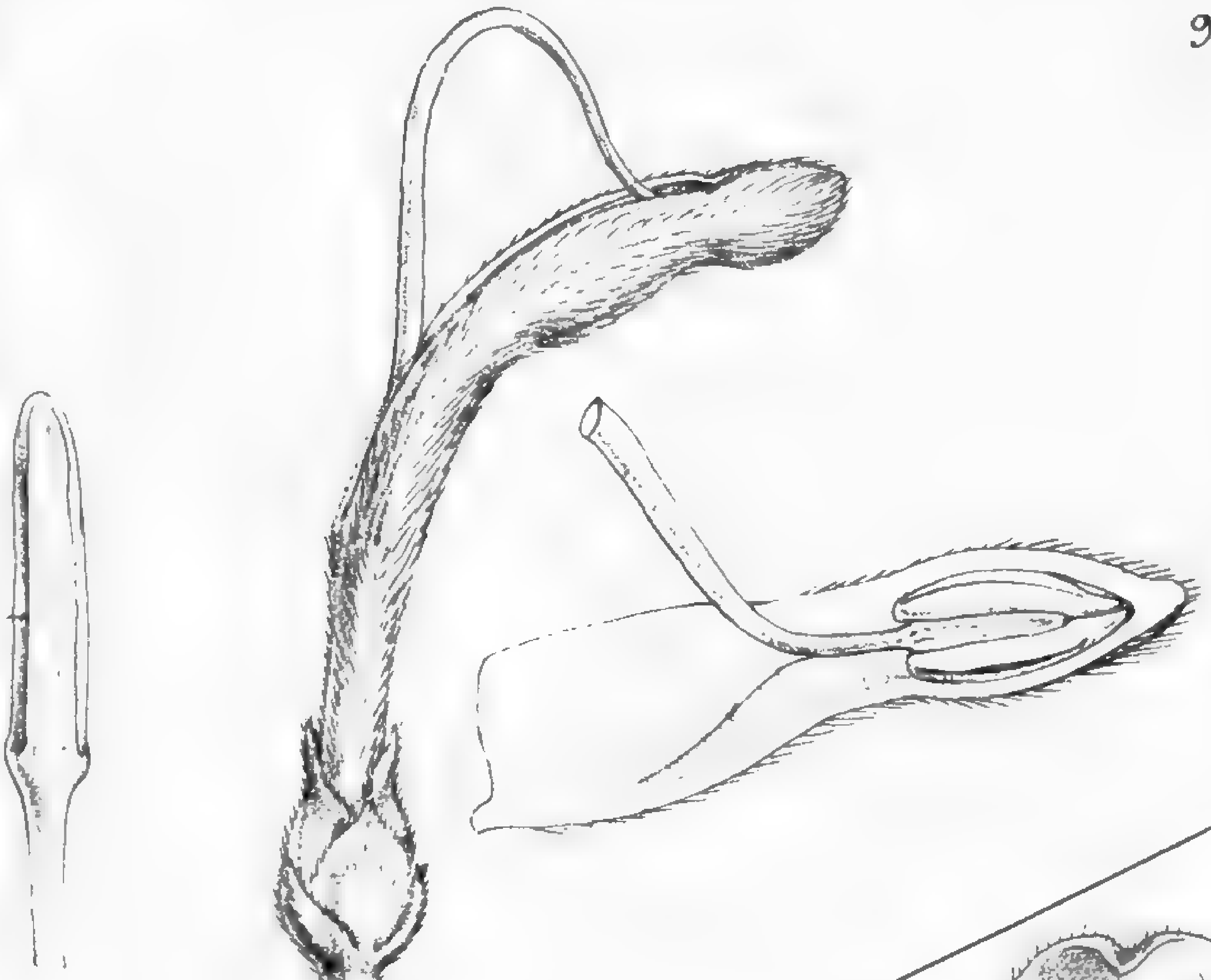
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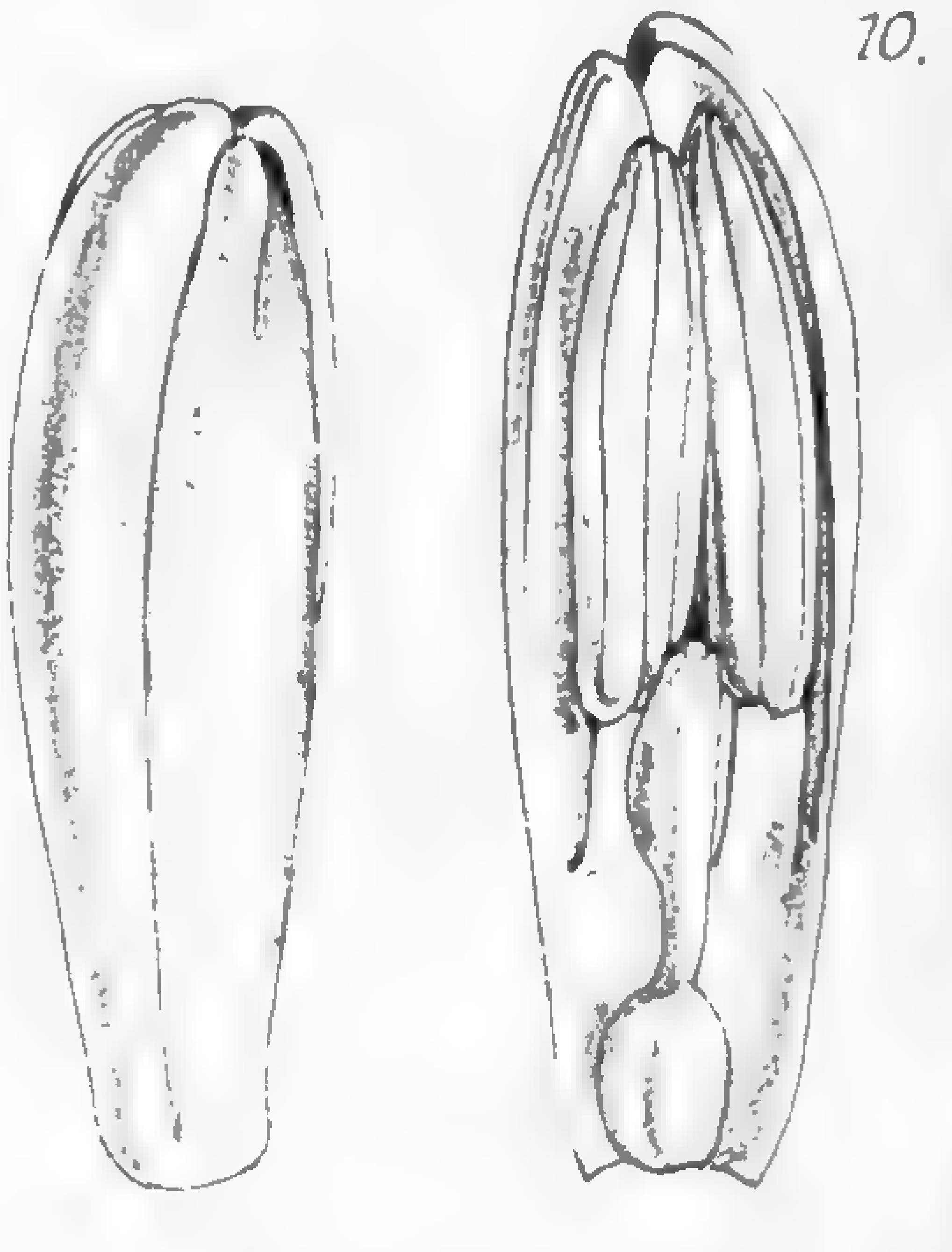
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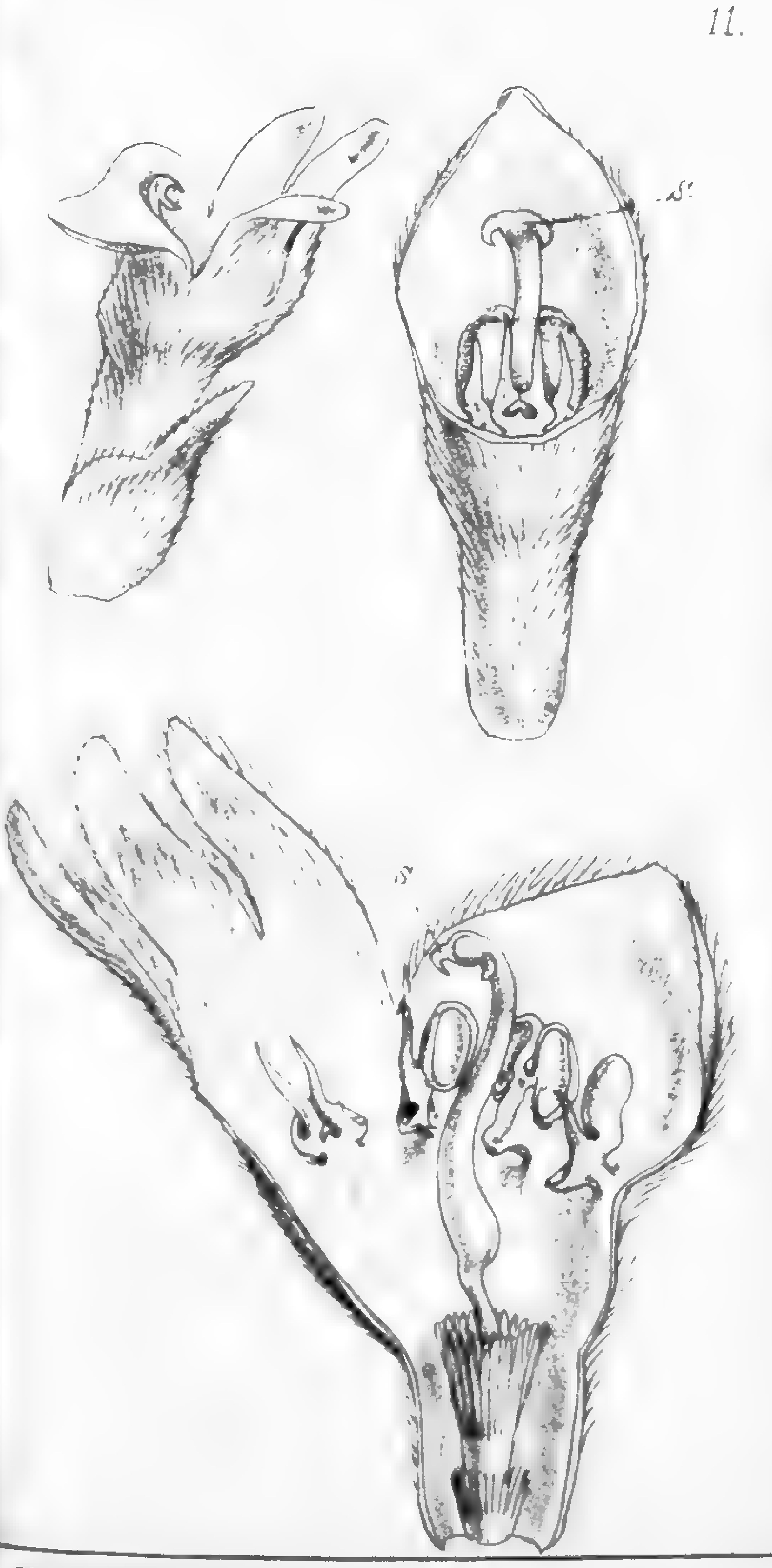
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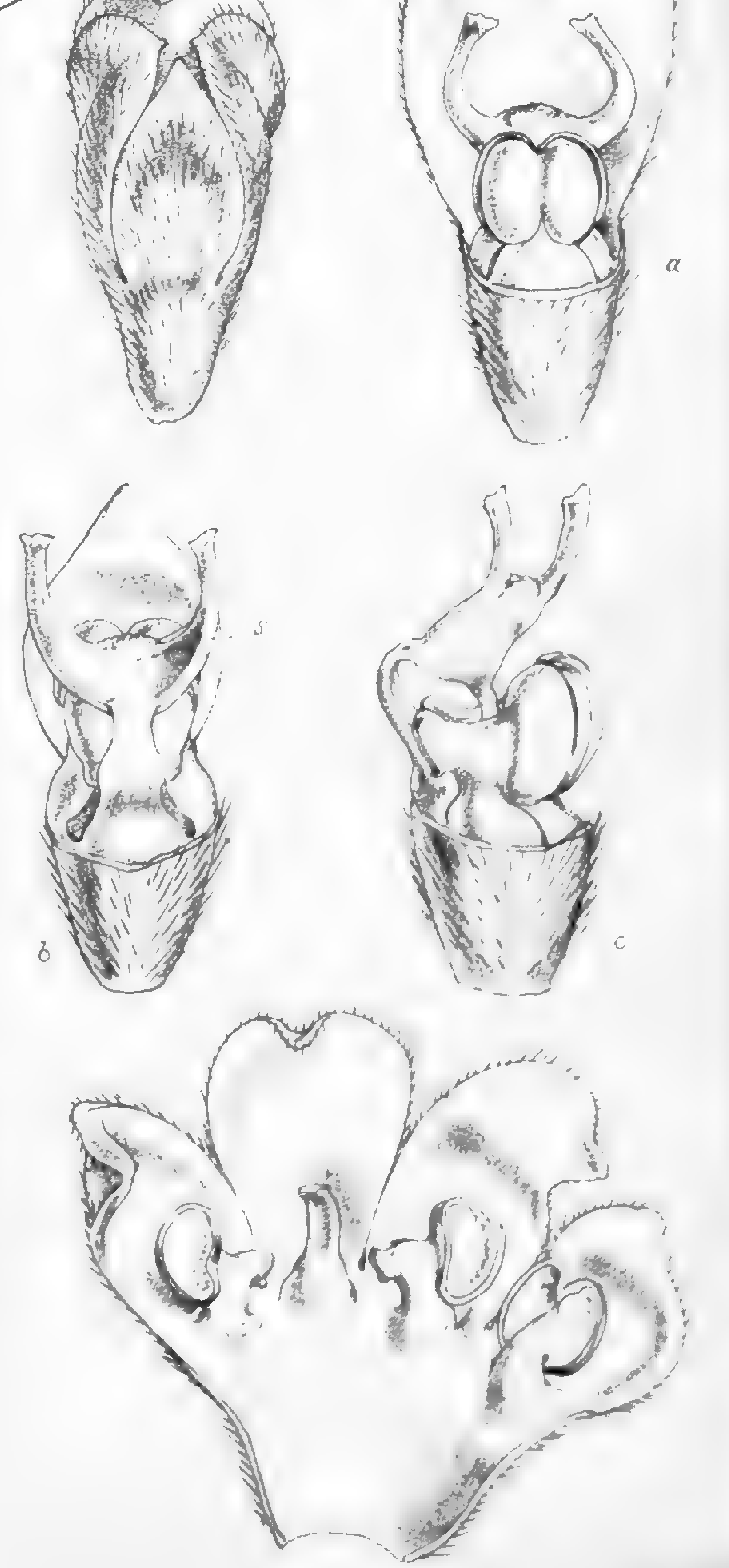
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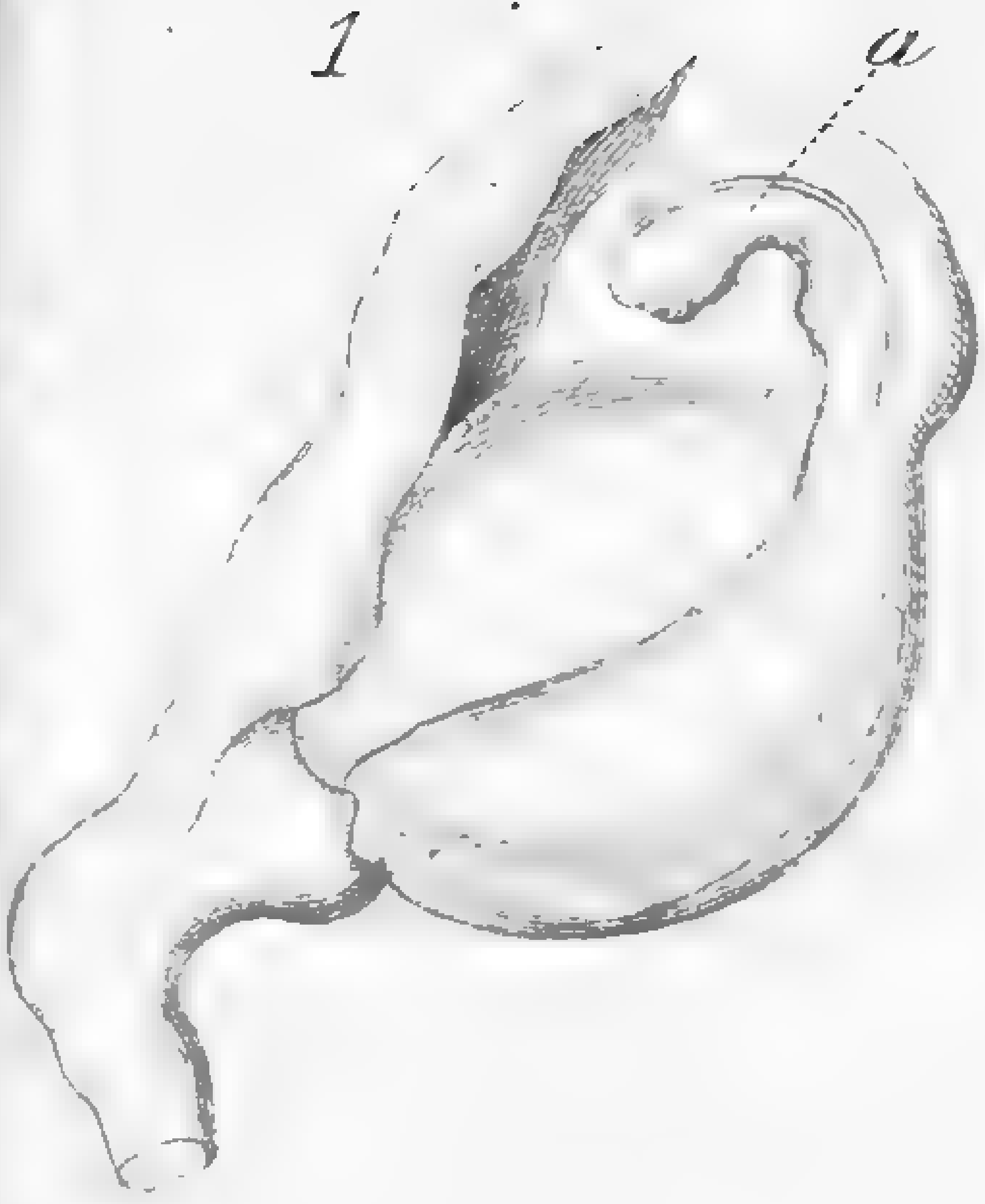

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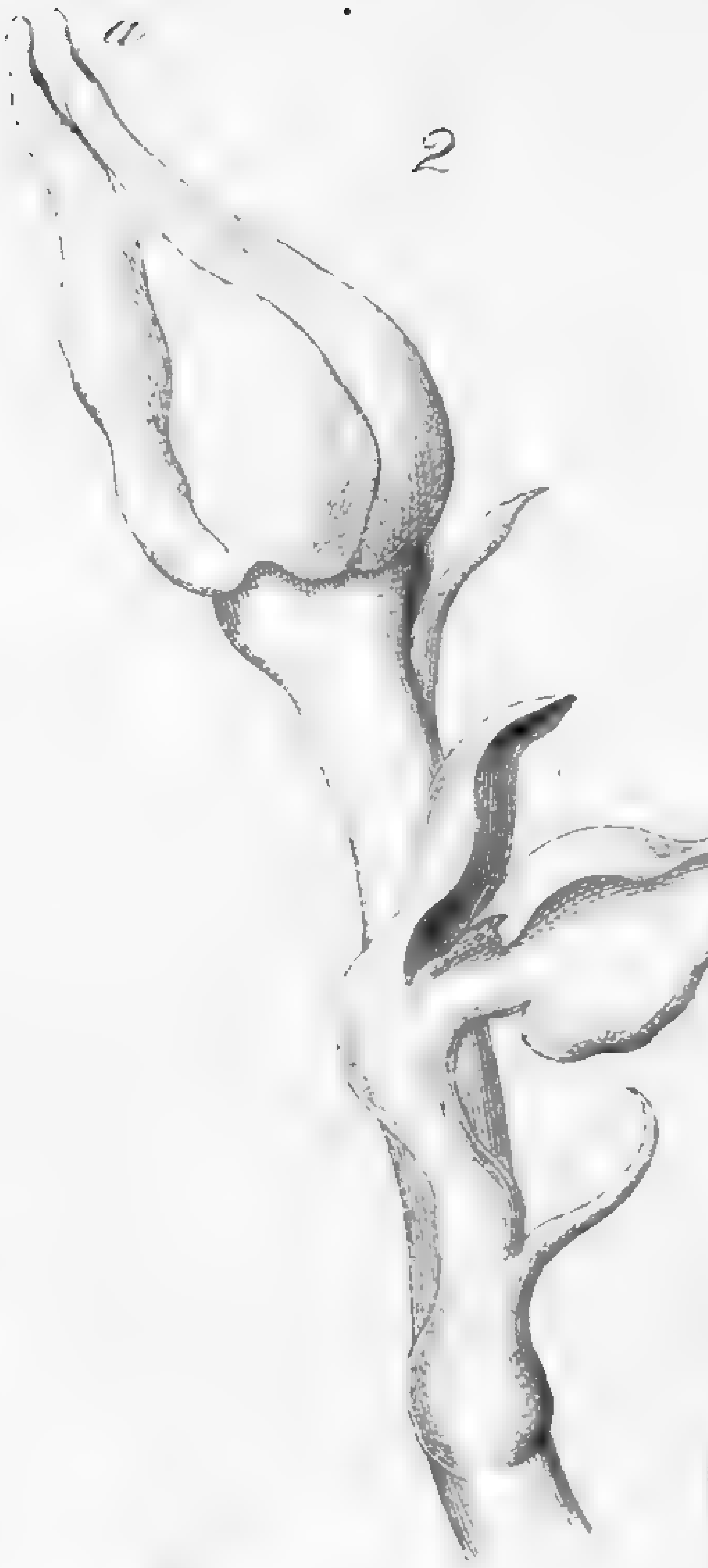

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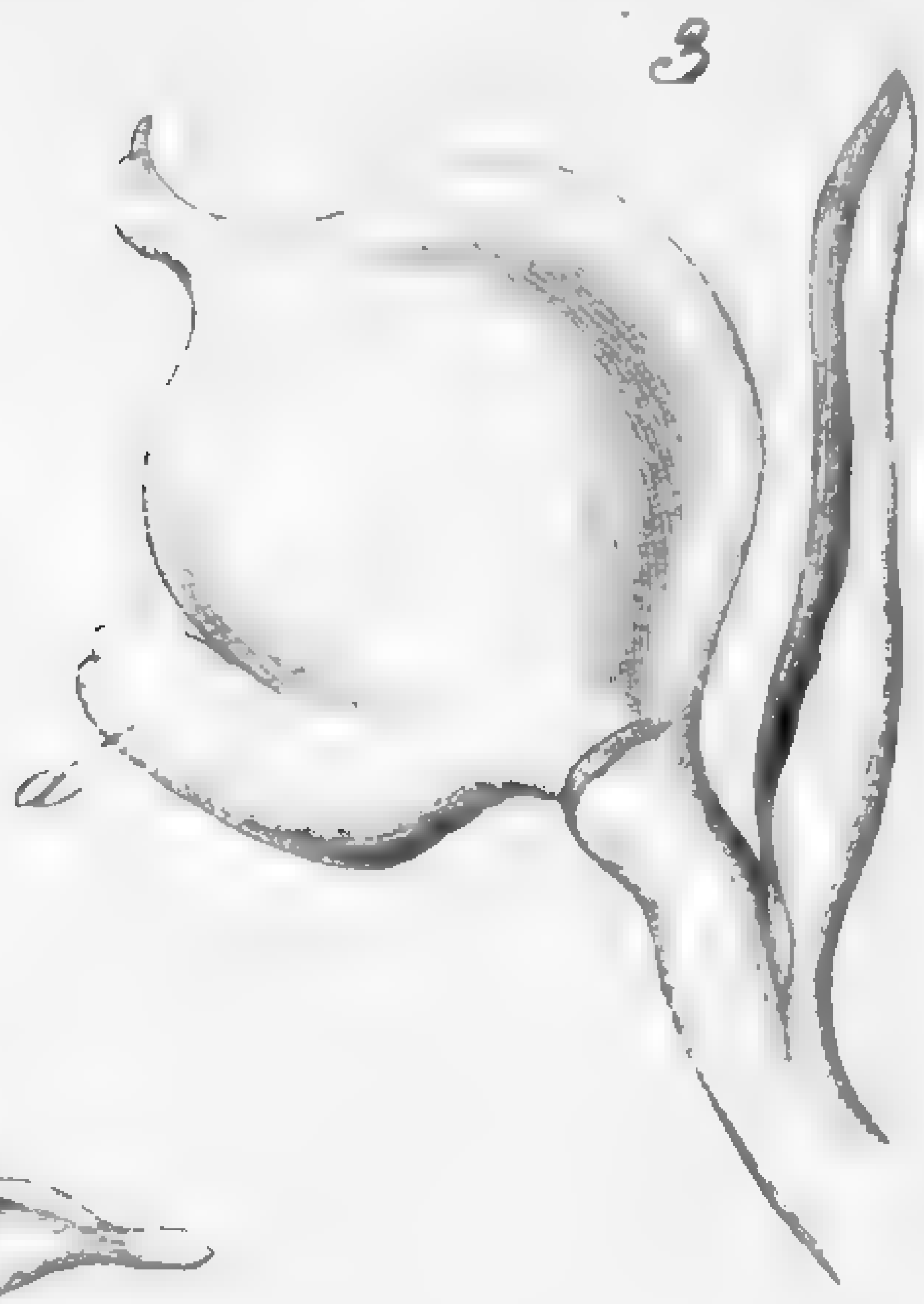

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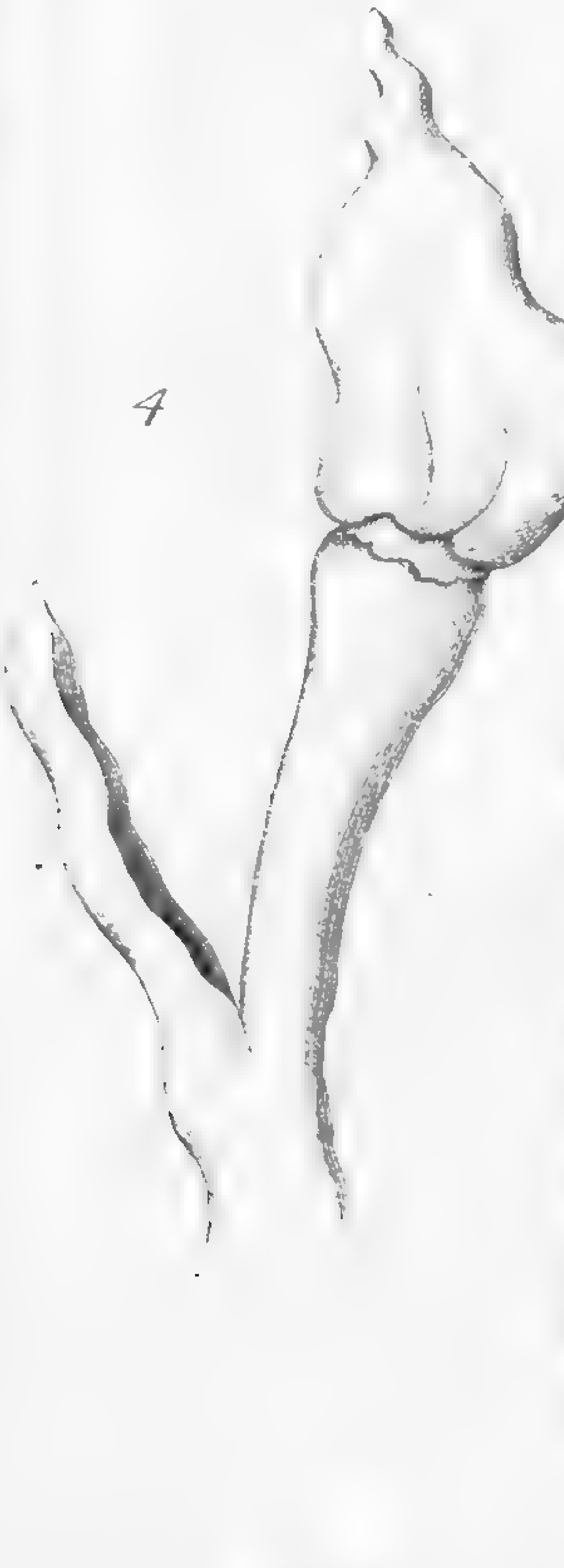

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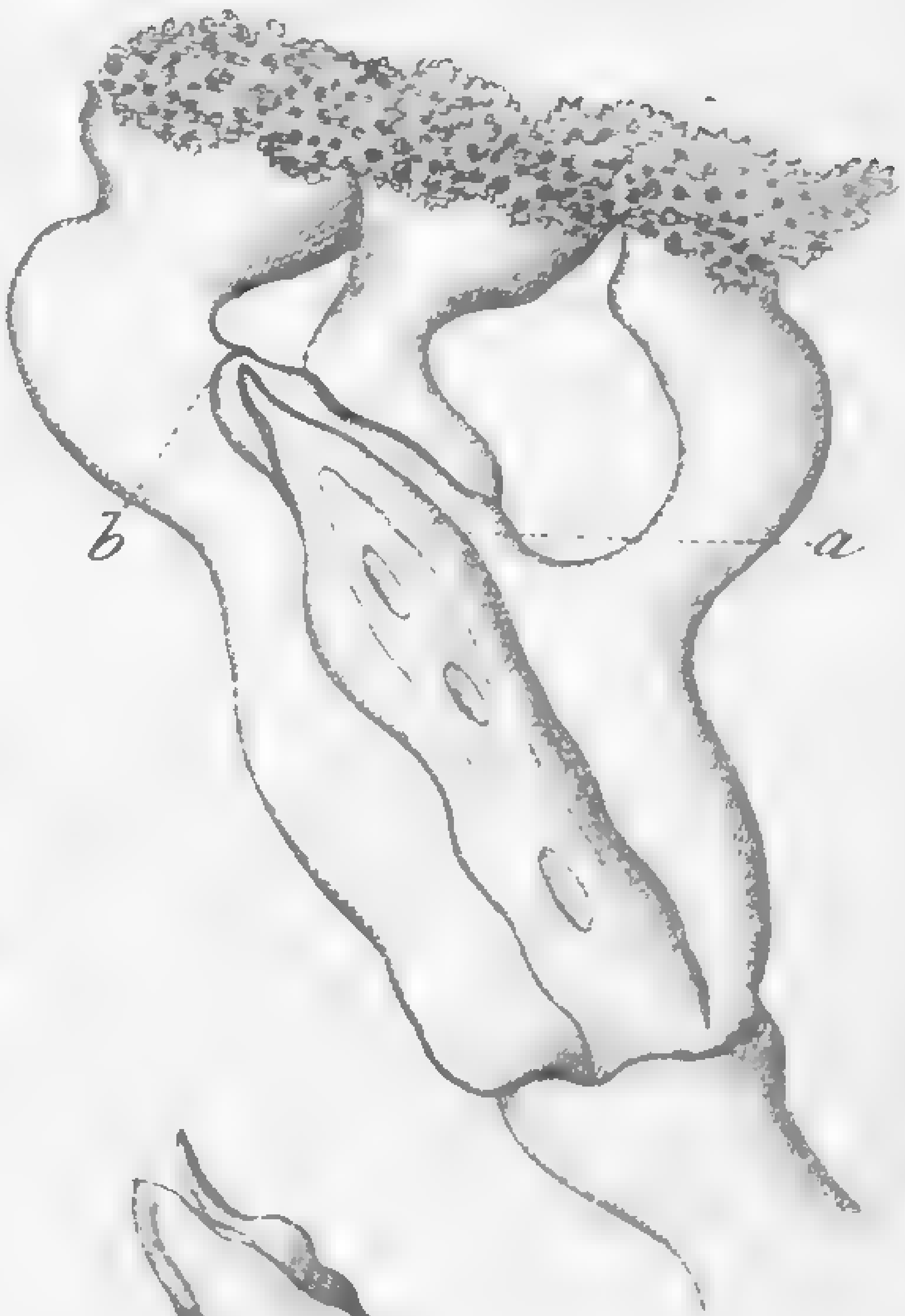

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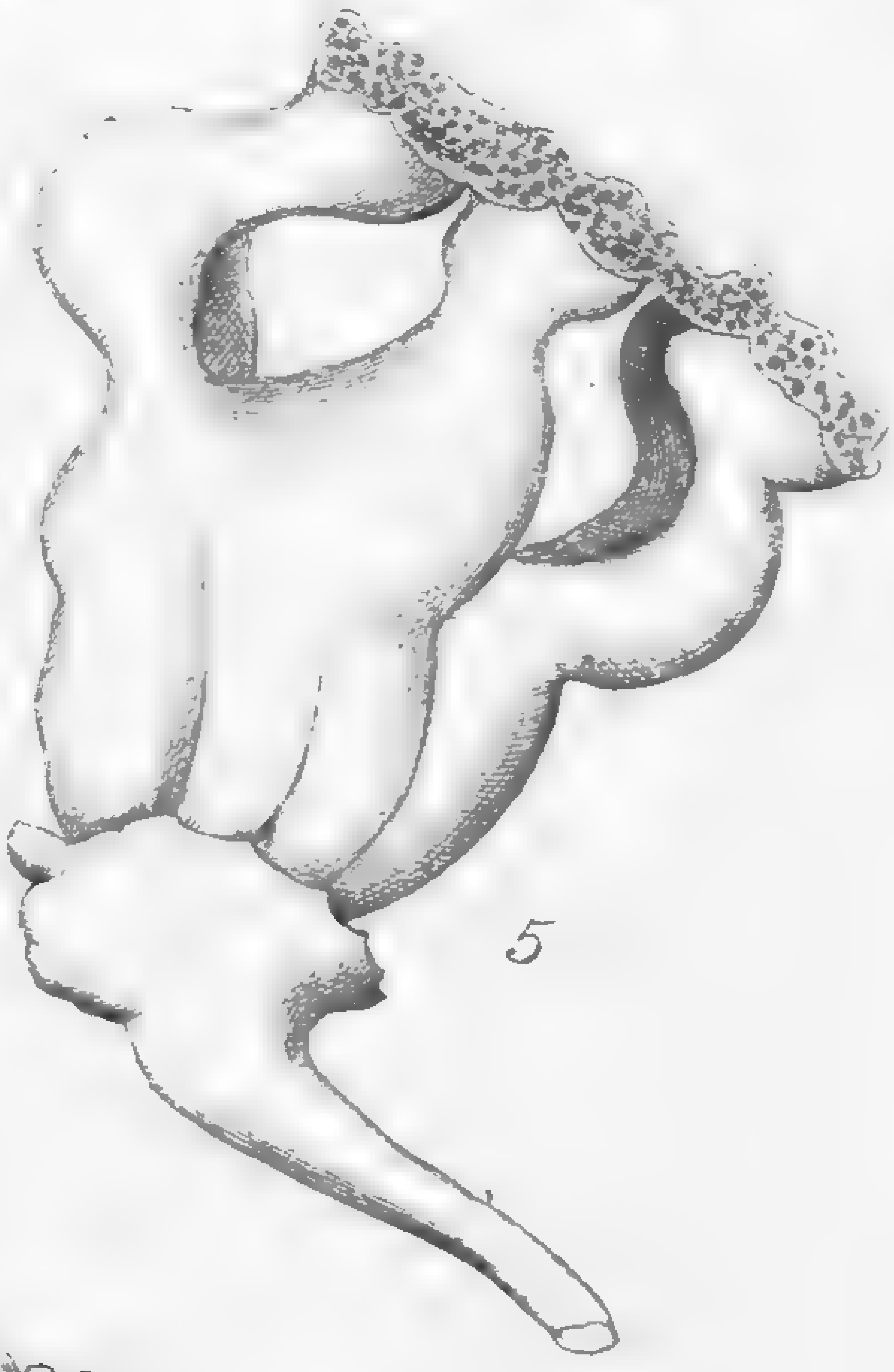

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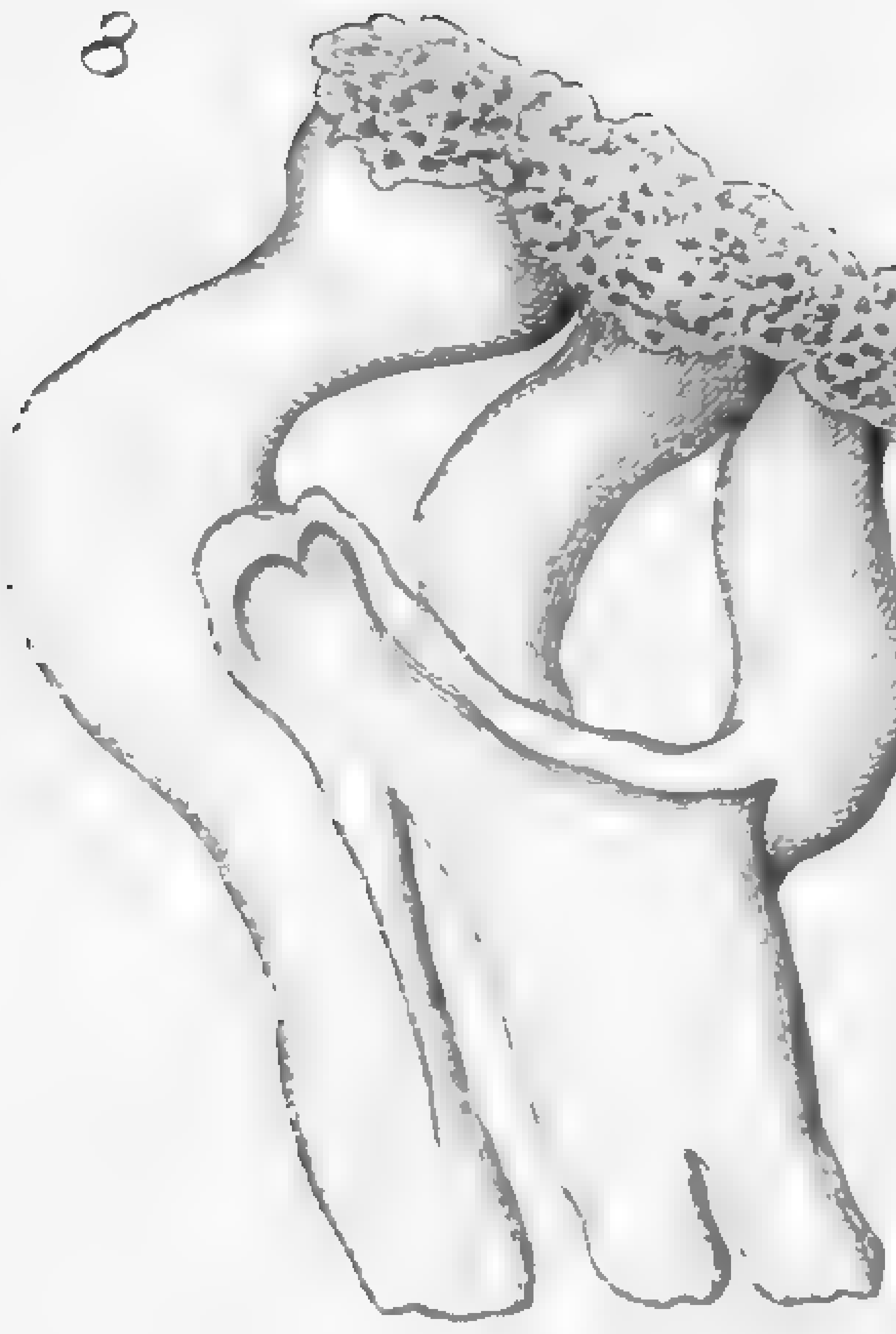

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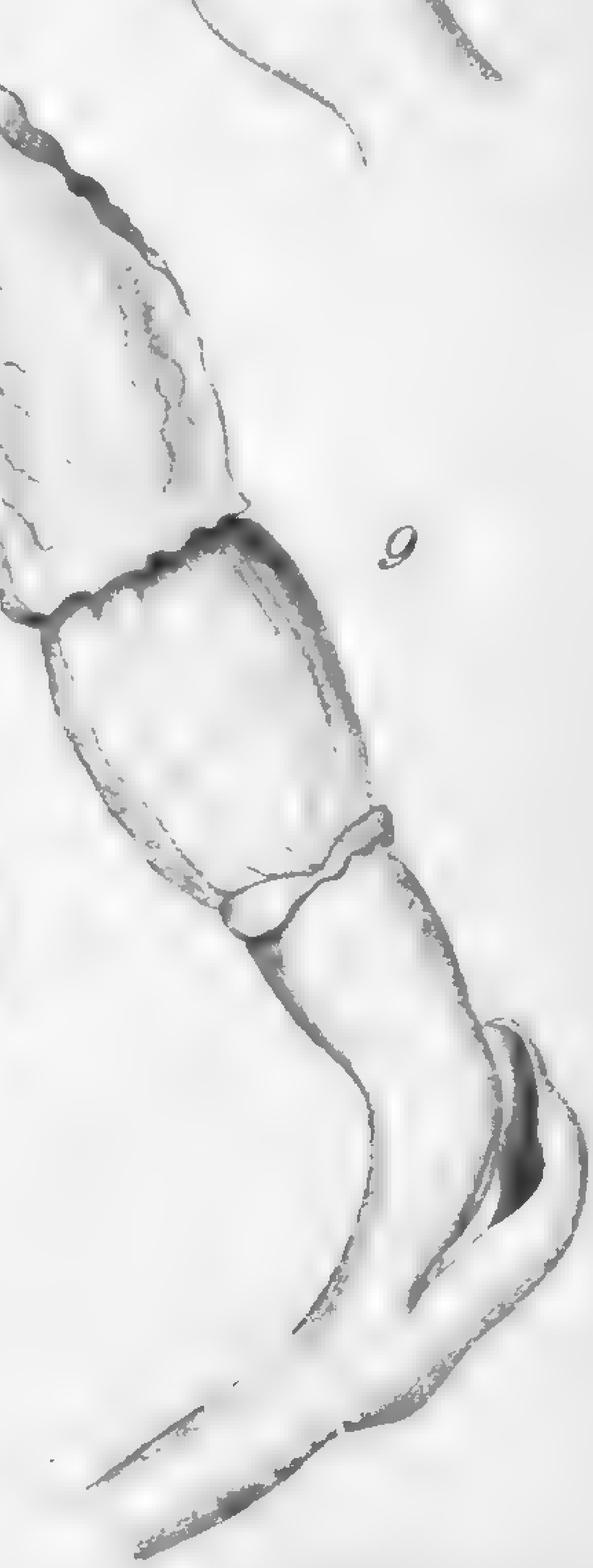

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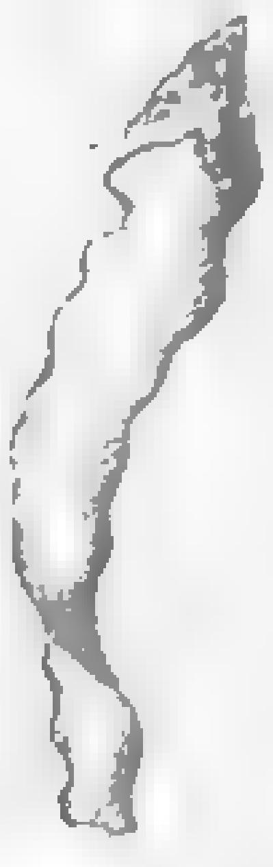

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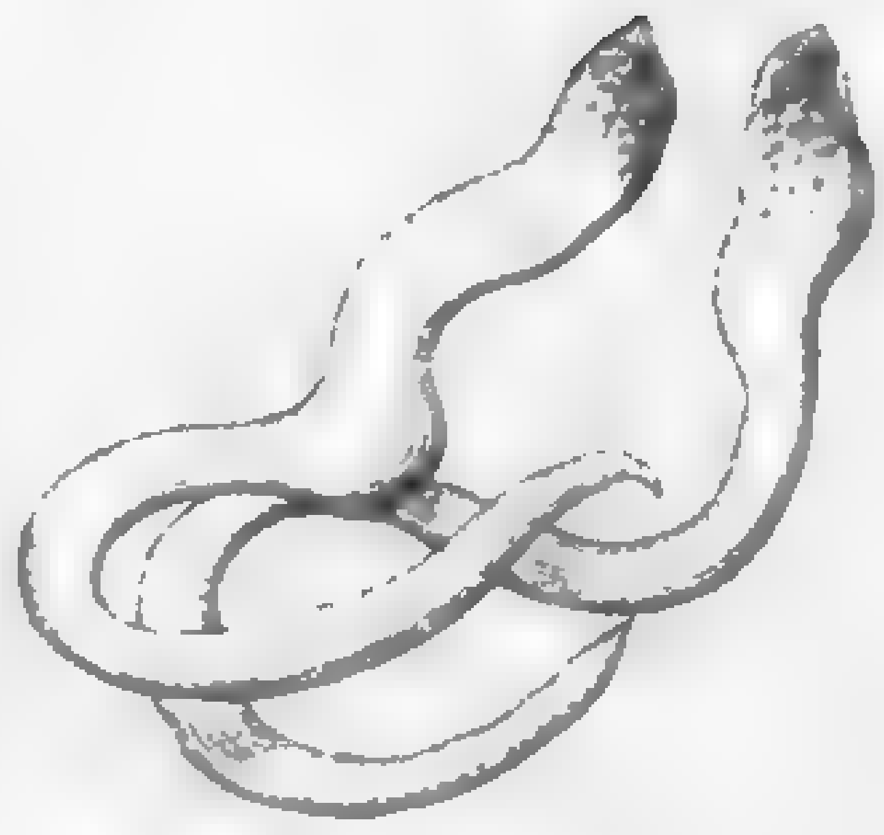

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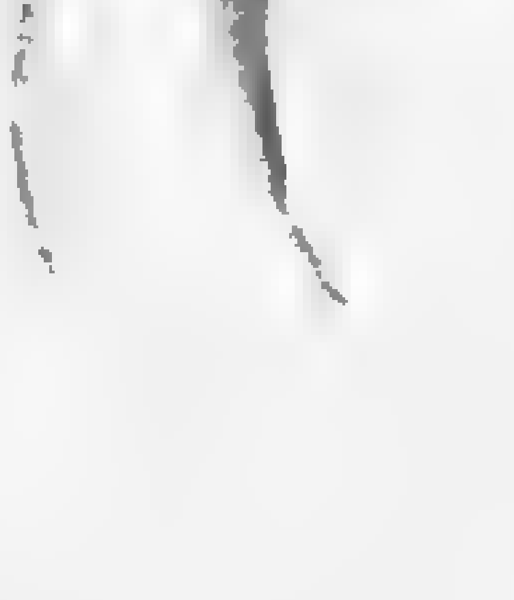

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14
19
×
13
16
18
×
15
p
17

M.T.M. del.

G. Jarman sc.

1
2
s
3
s
s
s
4
s
s
s
5
p
p
s
s
6
s
s
7
8
s
p
p
p
9
p
p
10
11
s
s
s
p
p
12
14
13
19
16
18
15
p
17

M. T. Masters del.

G. Jarman sc.

A
2
5
4
3
6
4
1
B
2
4
3
5
6
1
C
3
2
4
5
6
1
D
2
4
6
5
3
1

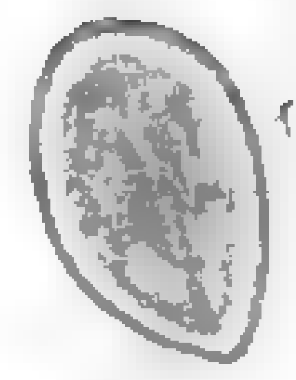
W. Mitten del.

G. Jarman sc.

1
c
d
b
a
e
2
b
c
e
d
a

W.A. Leighton del

G. Jarman sc



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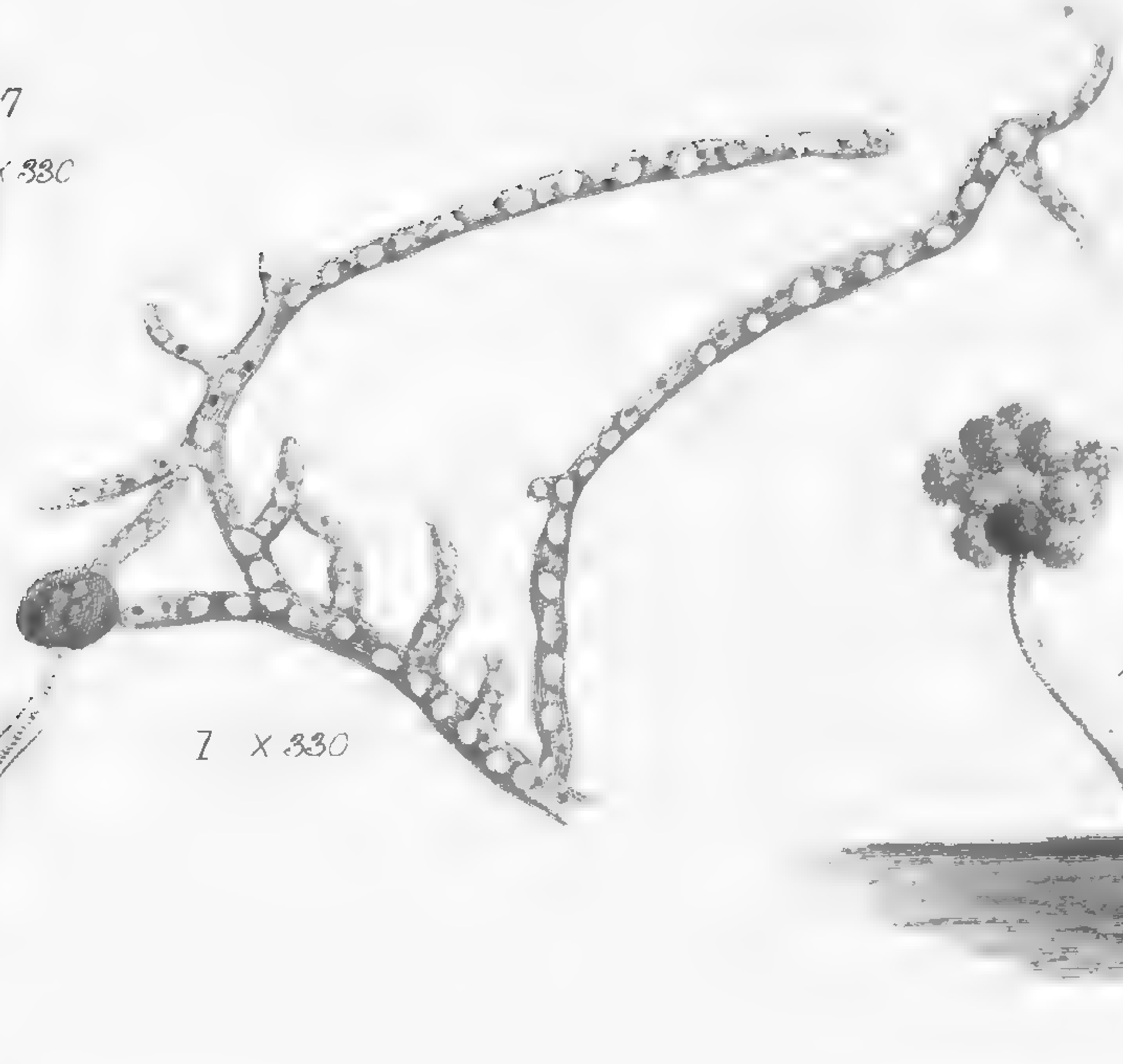

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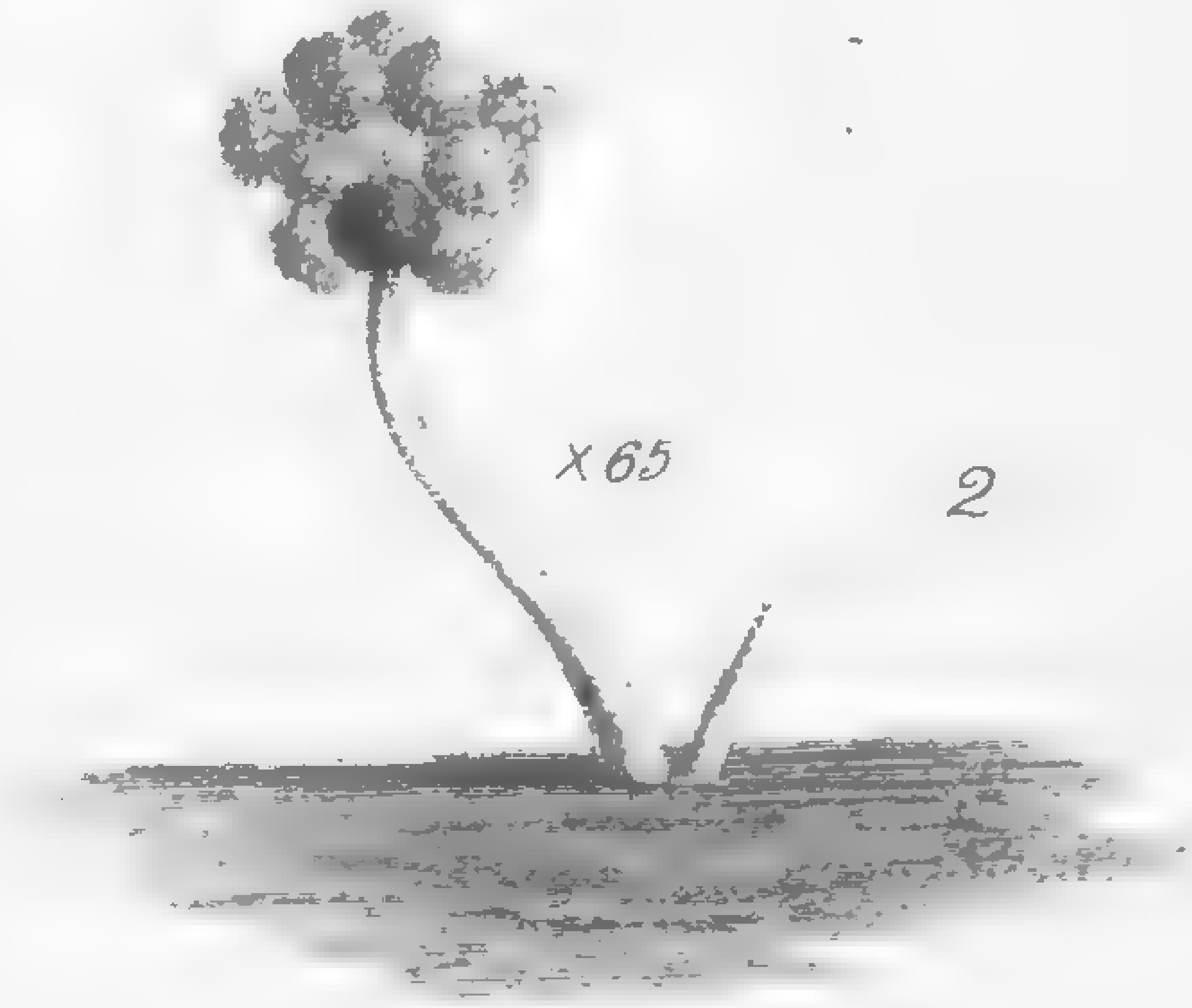

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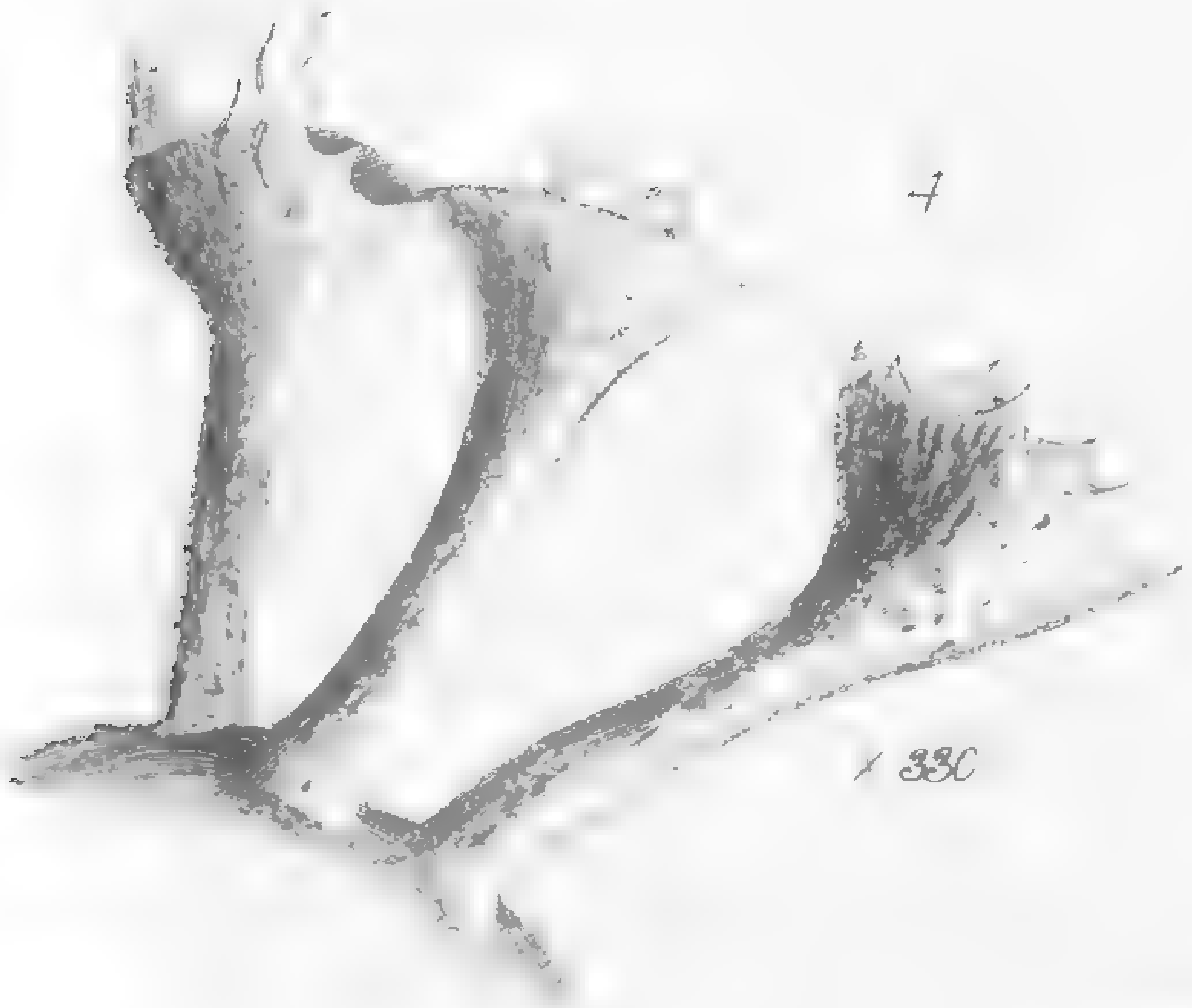

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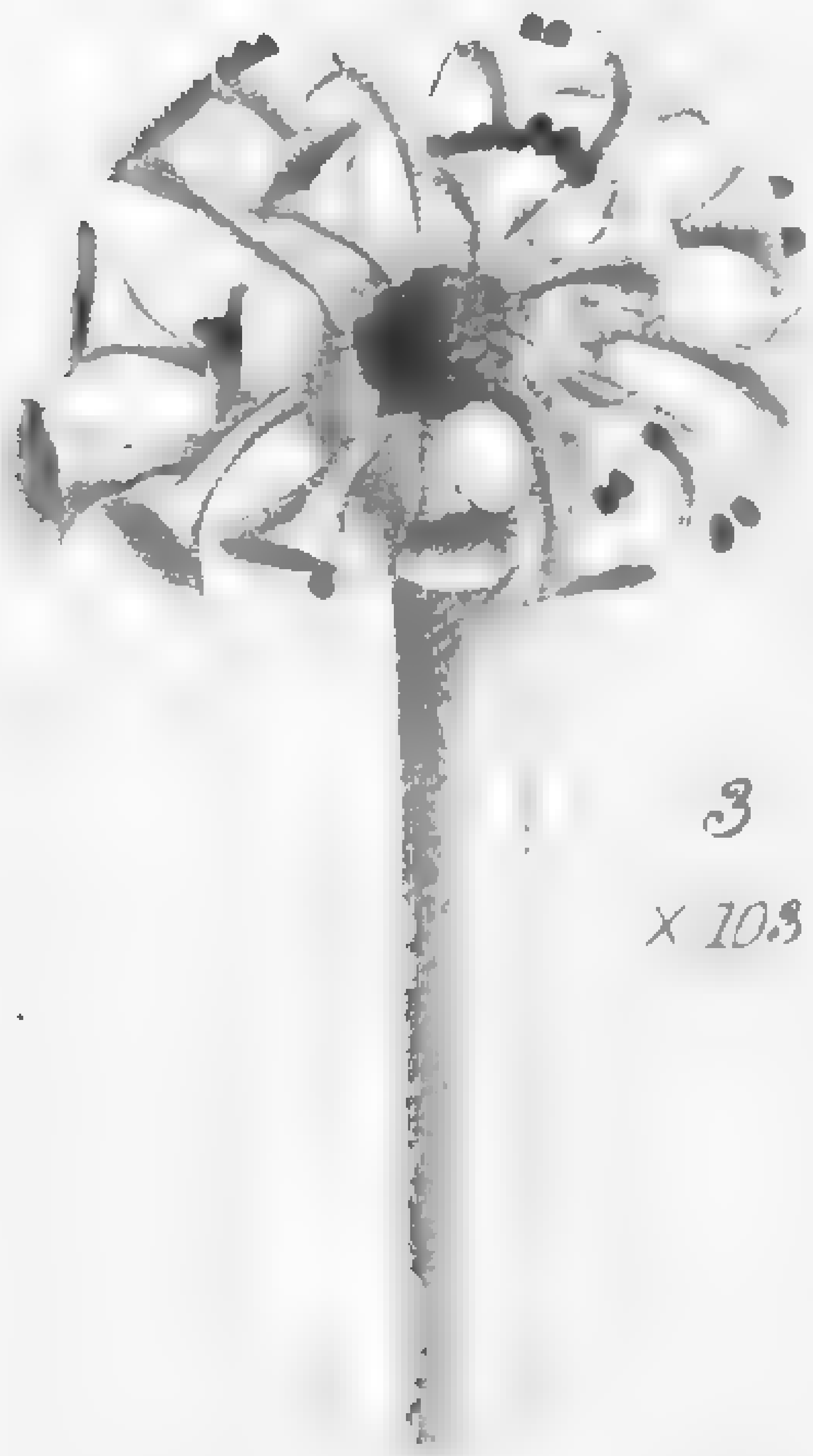

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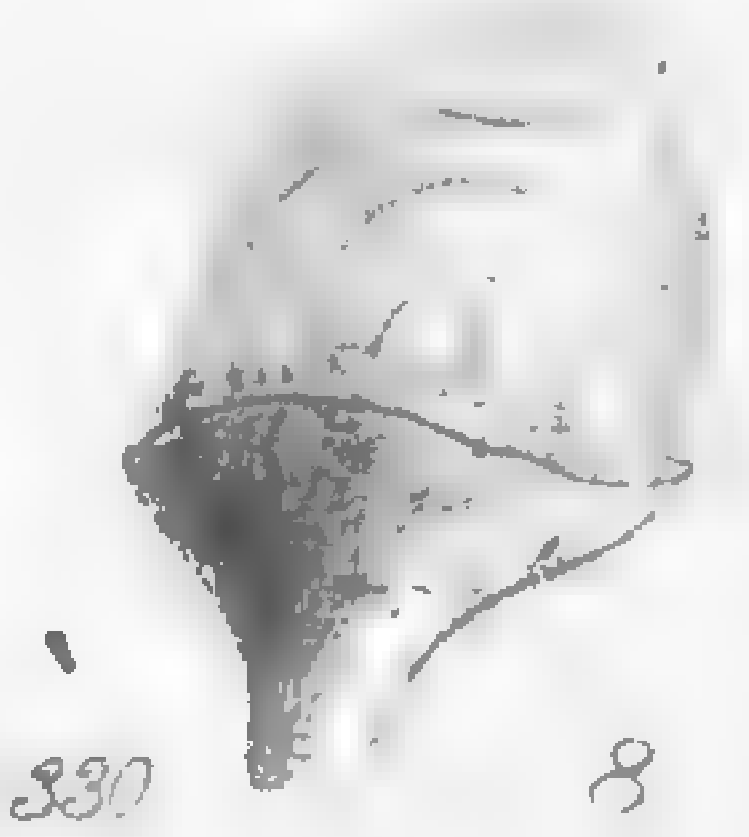

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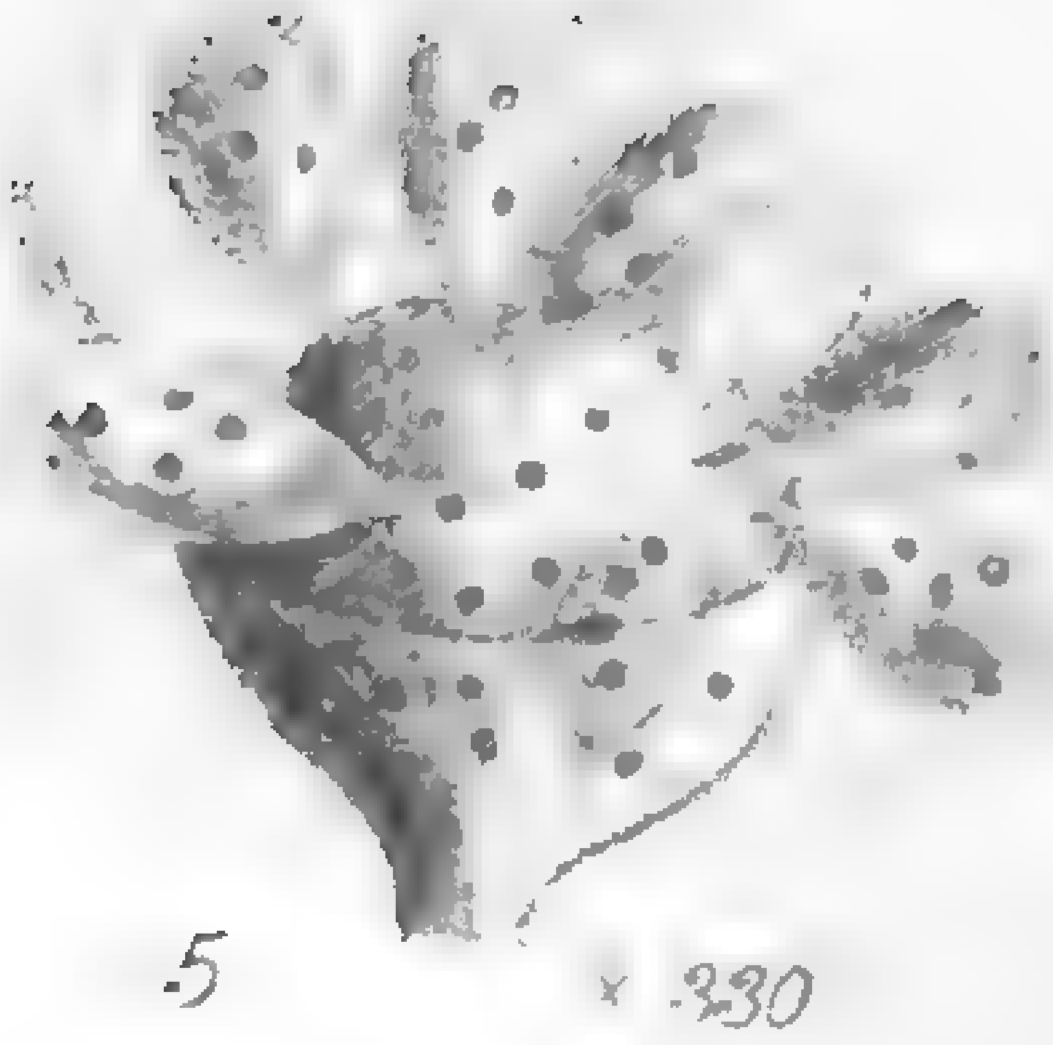

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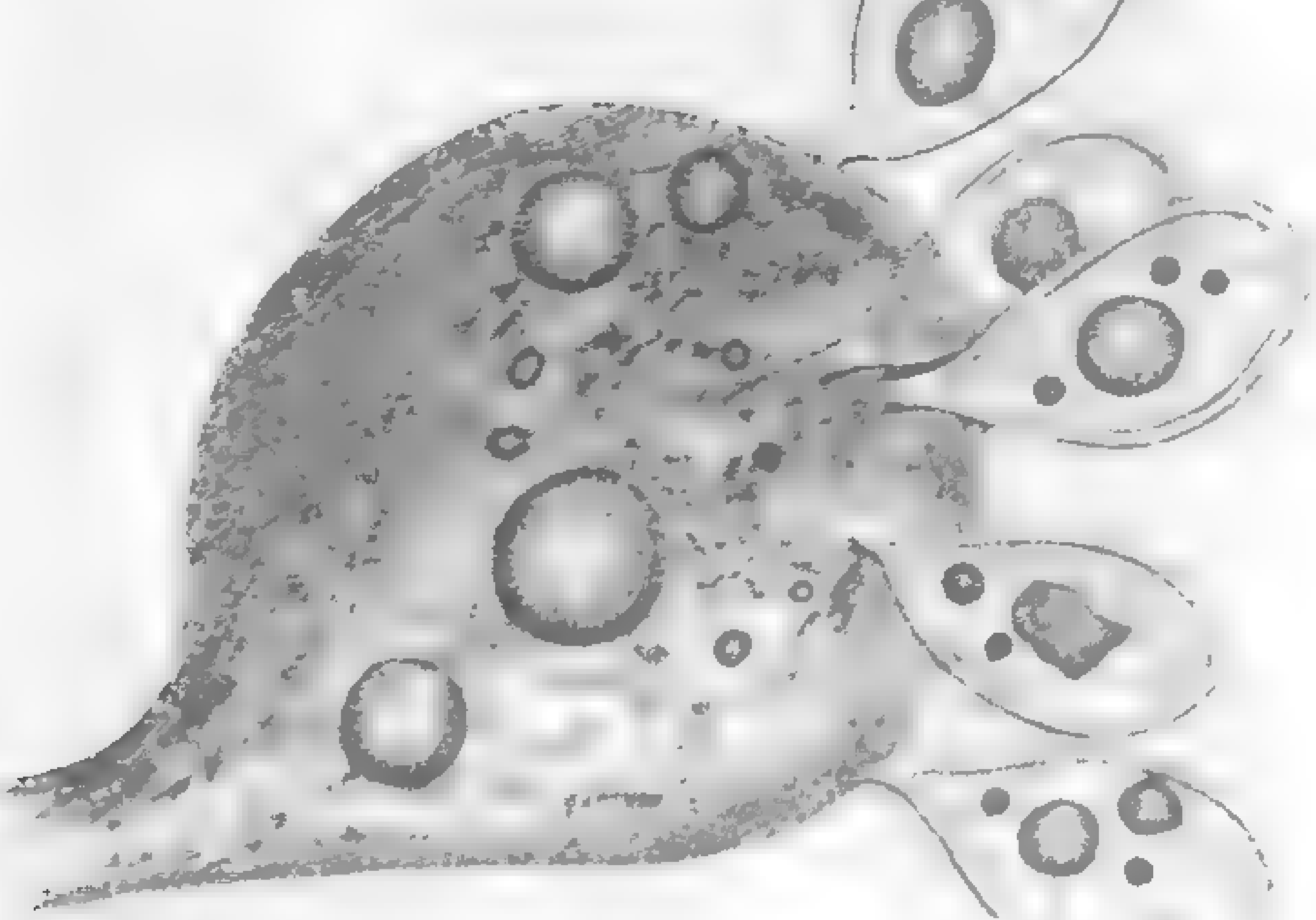

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D.D. Cunningham del.

G. Jarman sc.

W. H. Fitch lith.
J. N. Fitch imp

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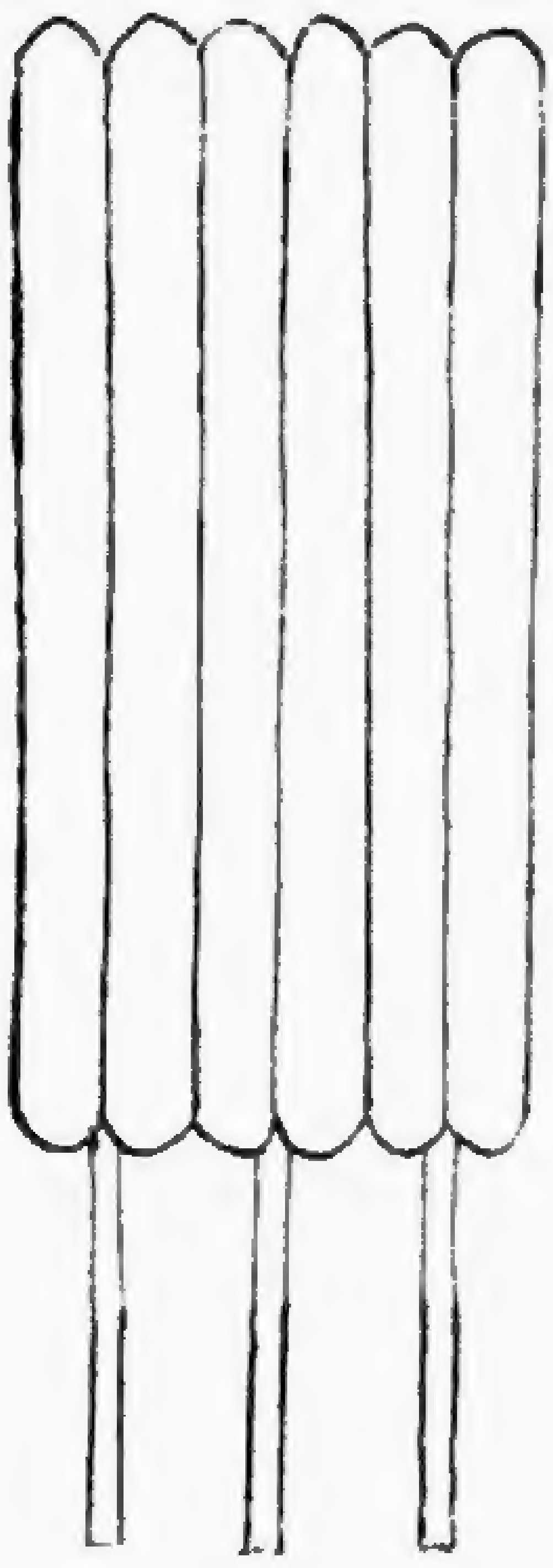

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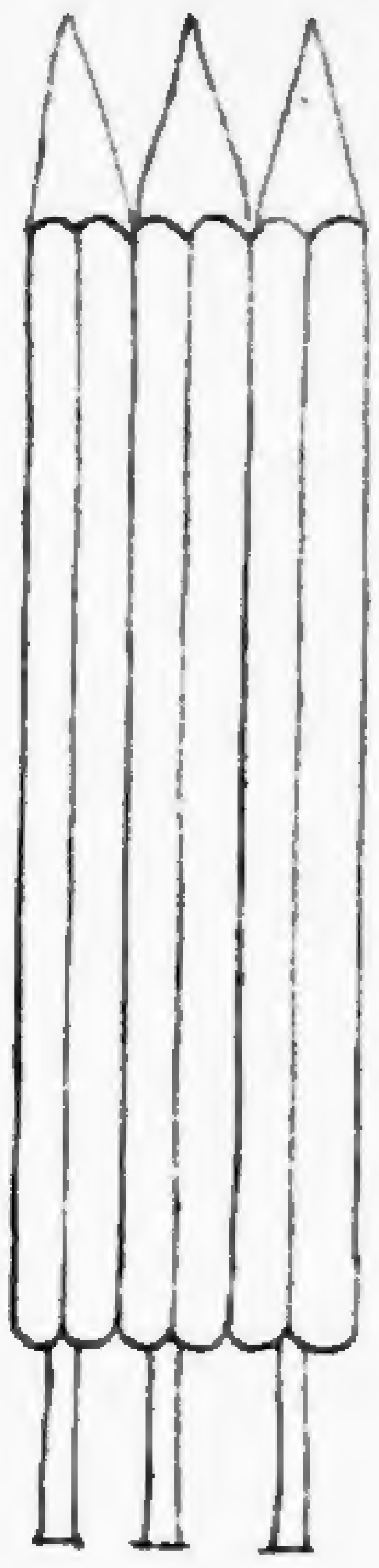

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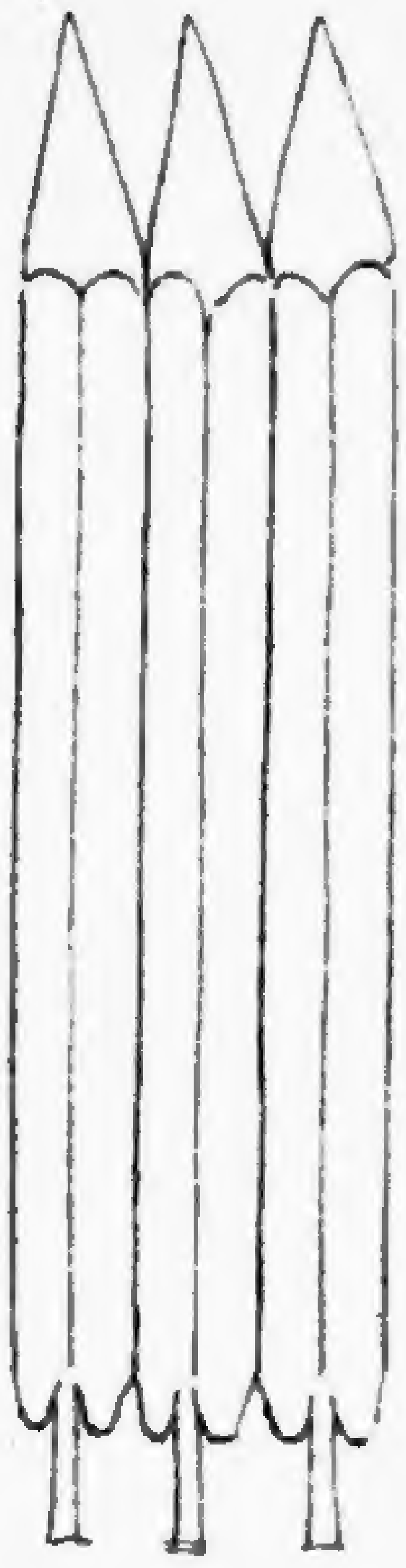

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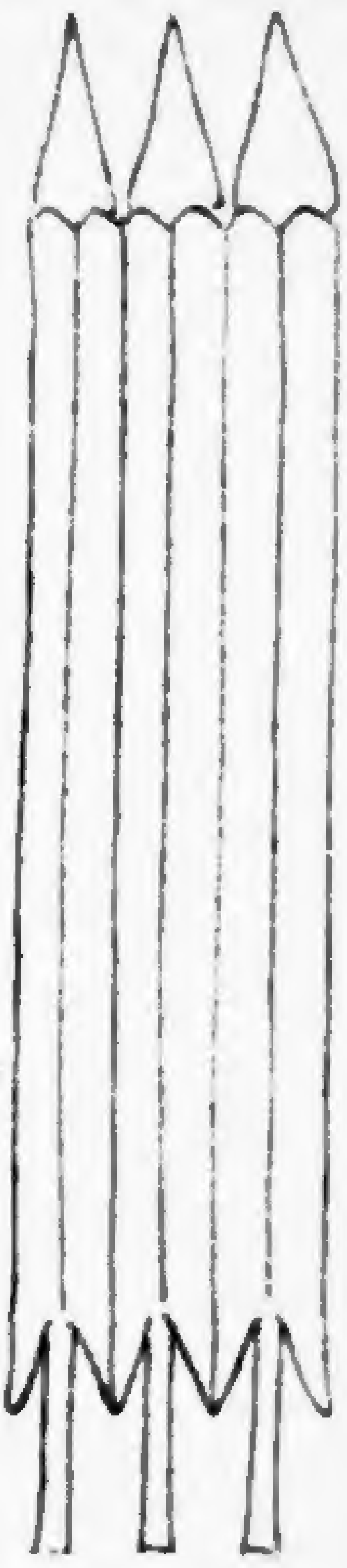

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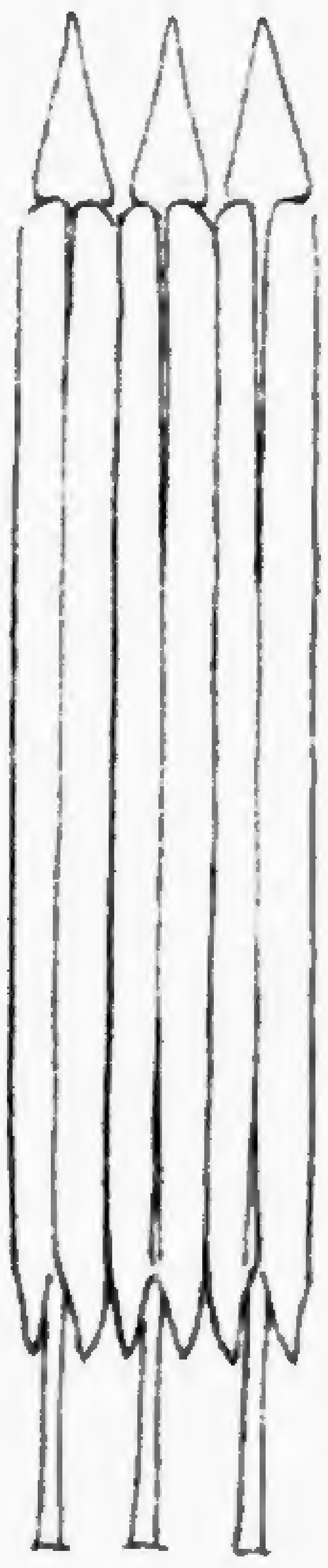

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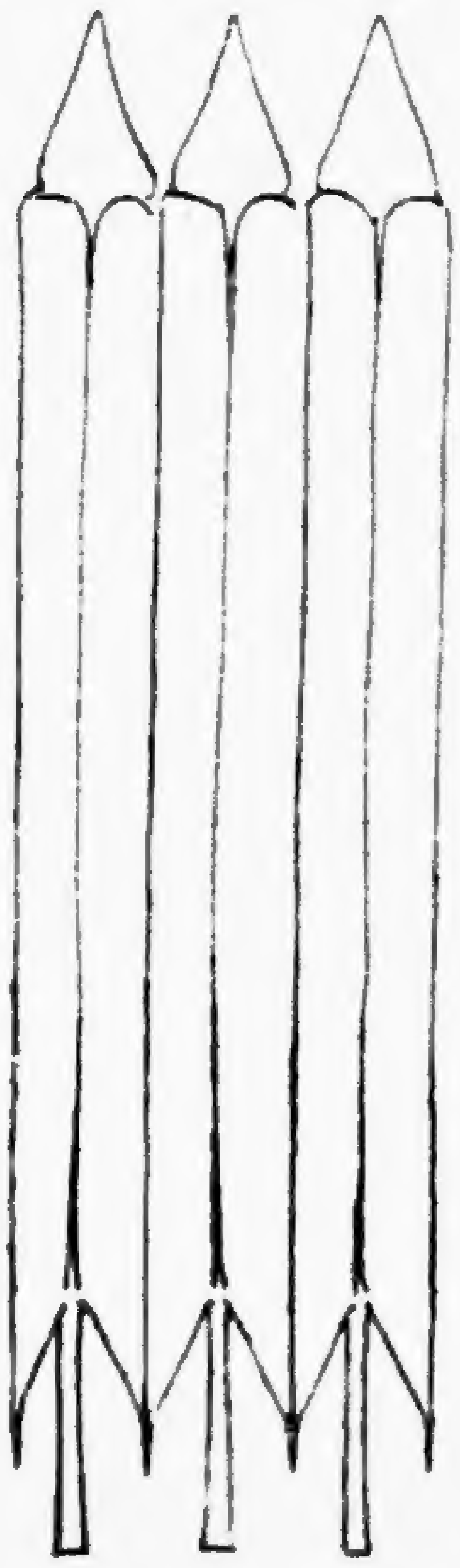

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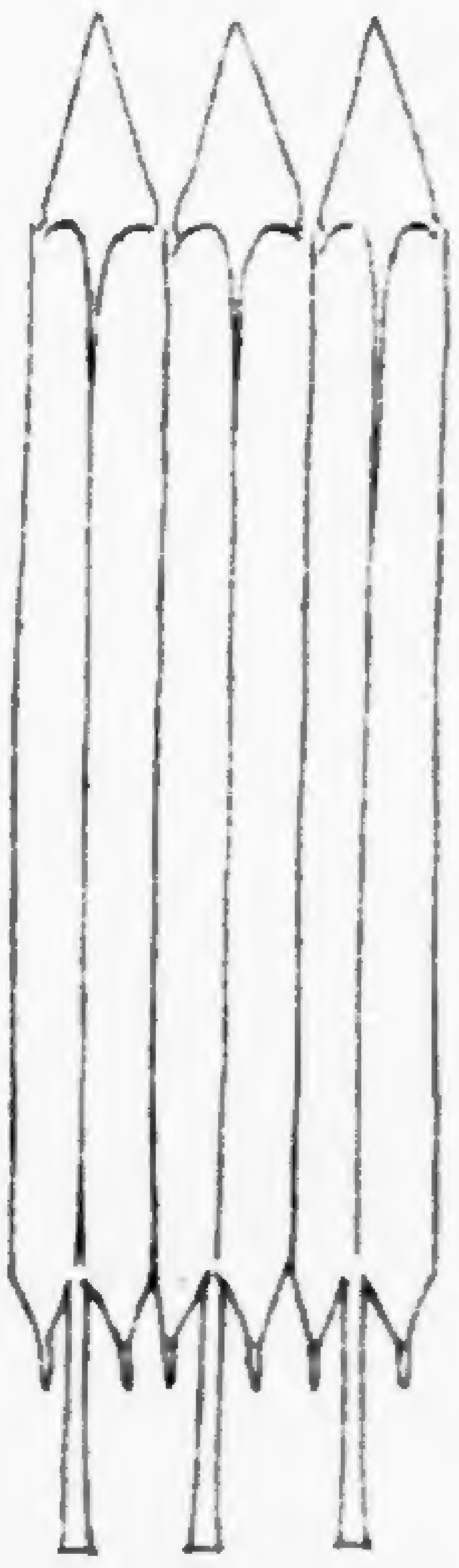

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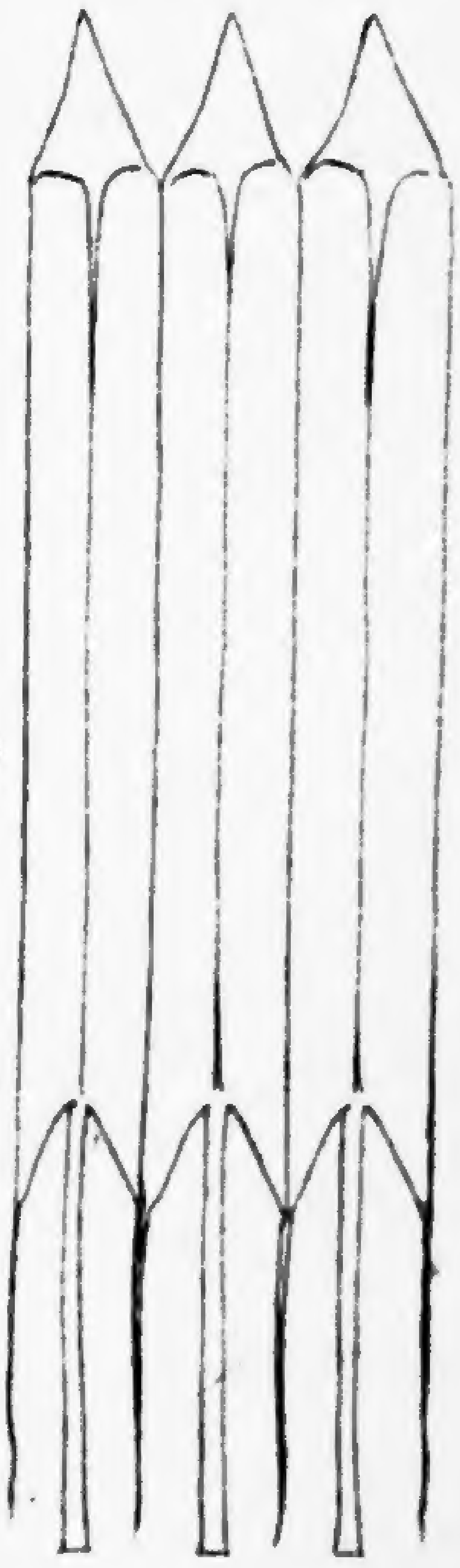

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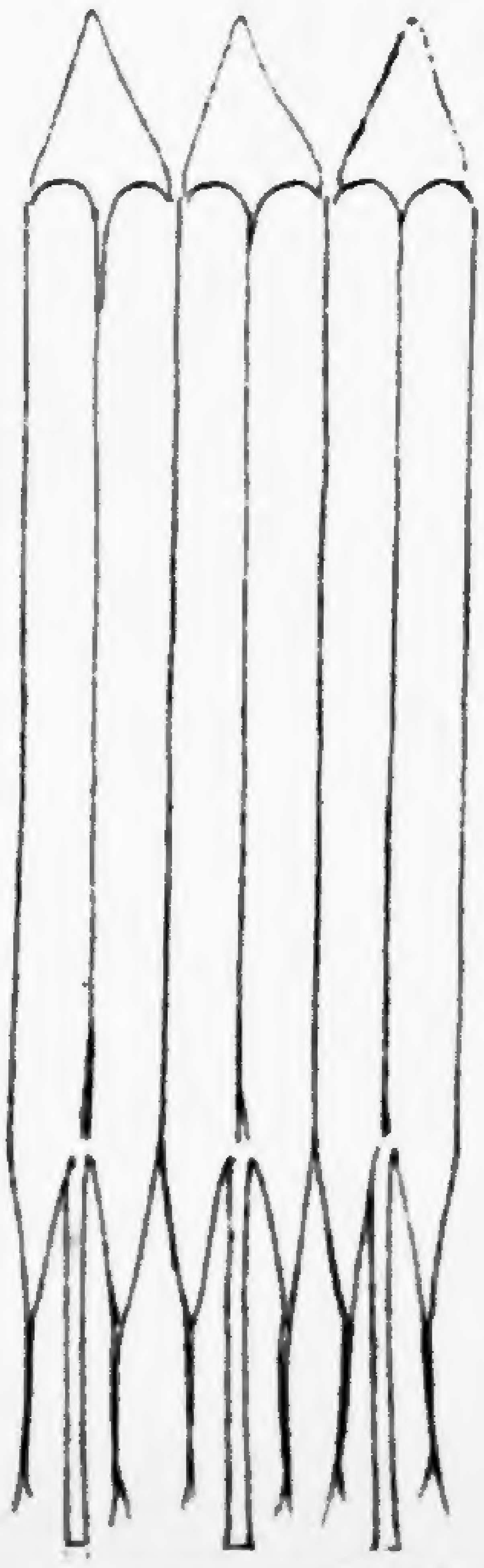

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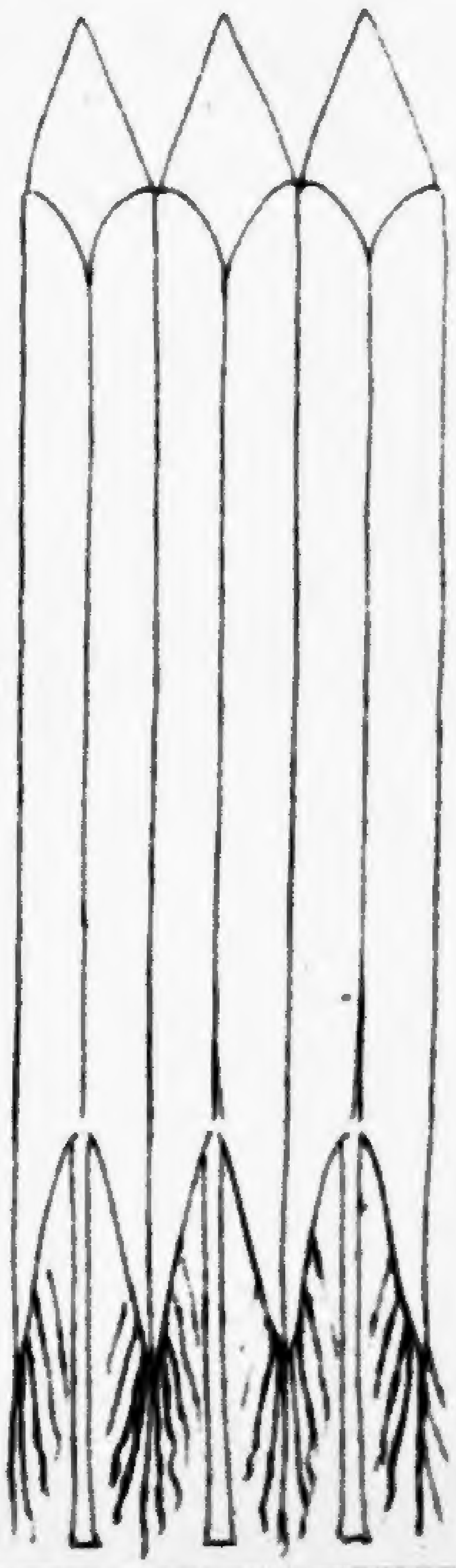

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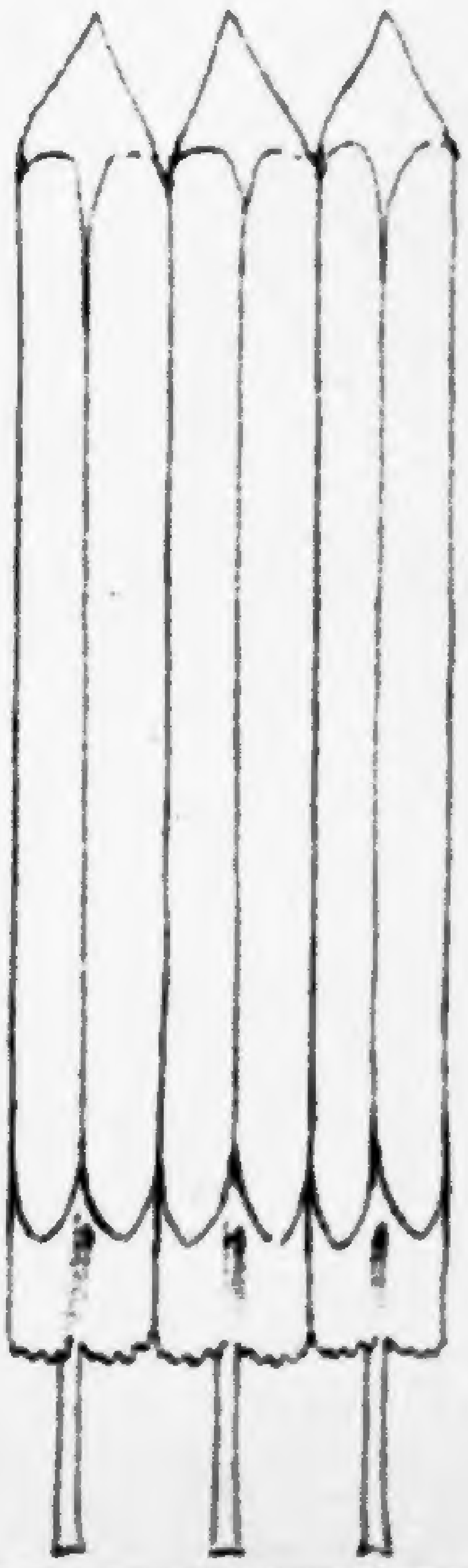
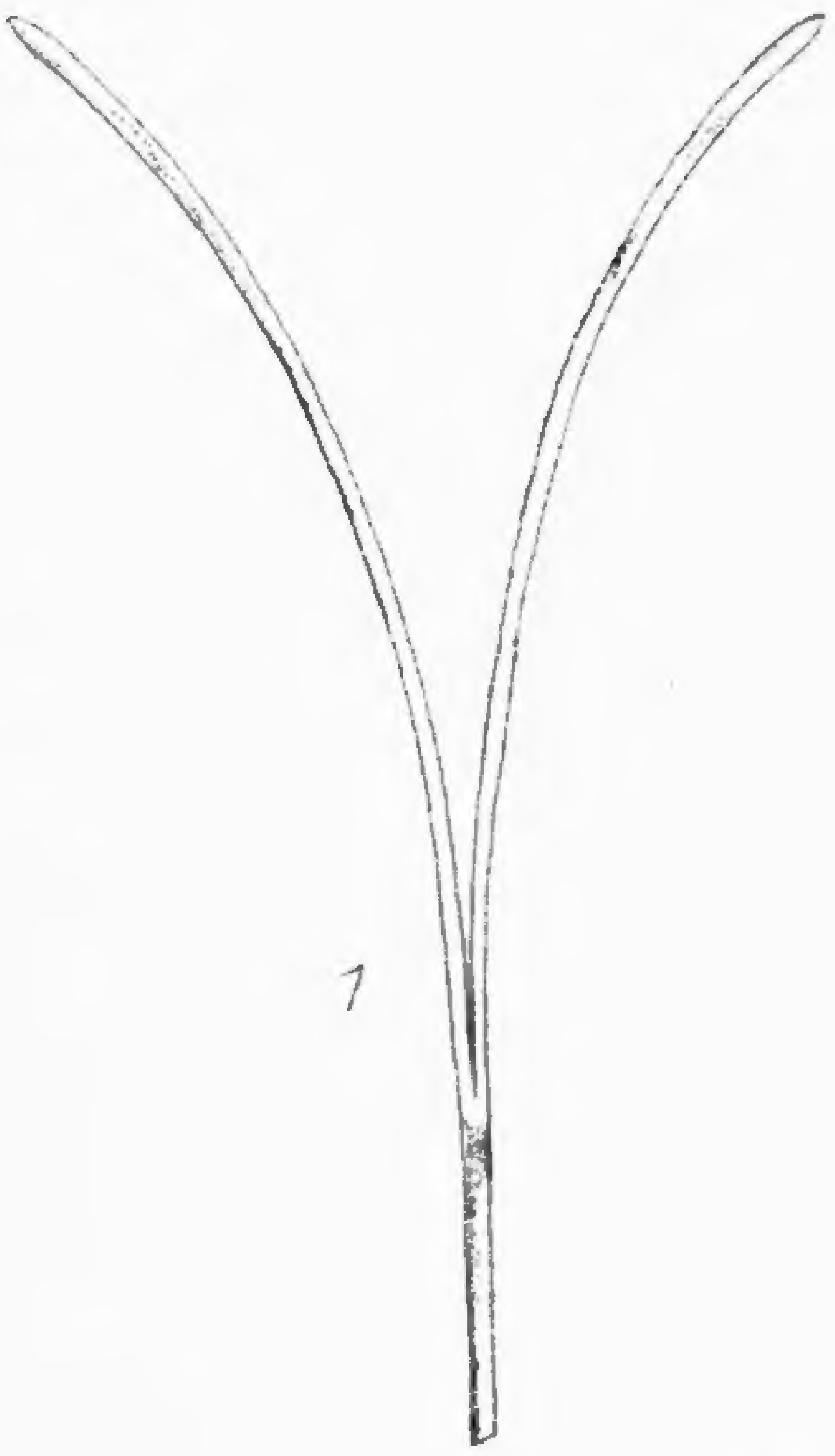


W.H. Fitch lith.

J.N. Fitch imp



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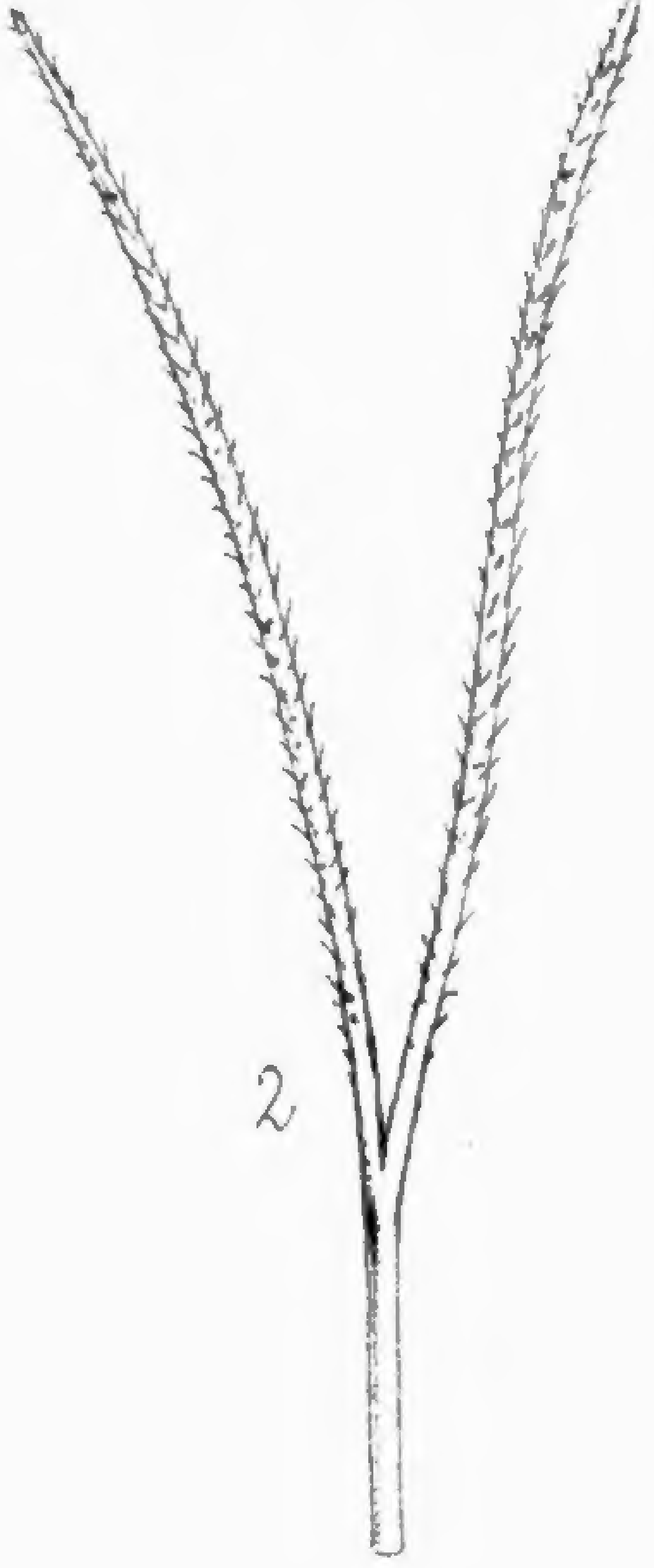

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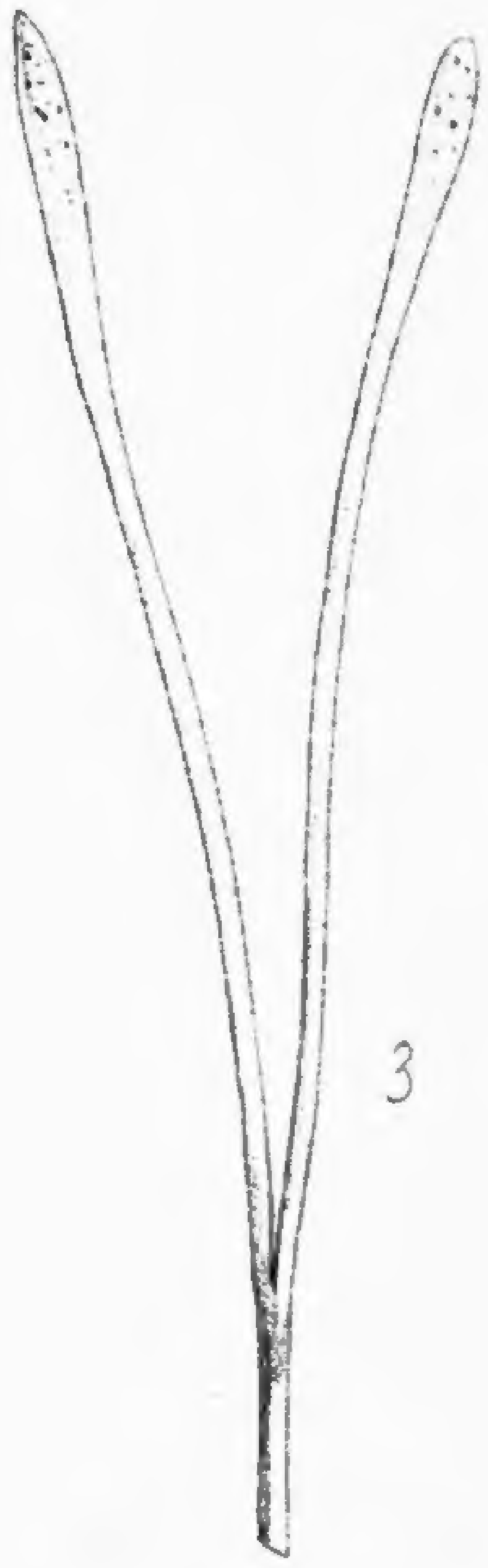

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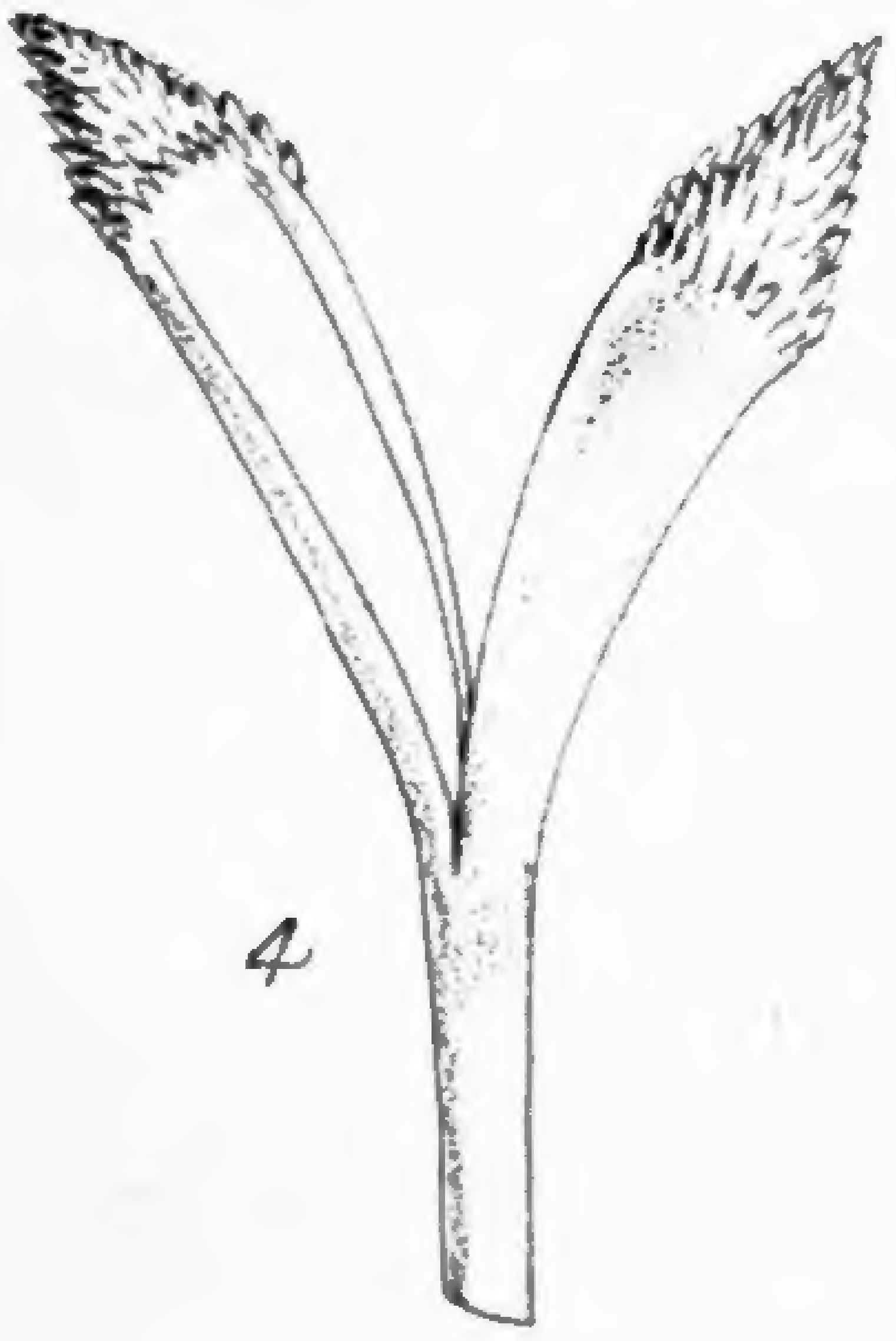

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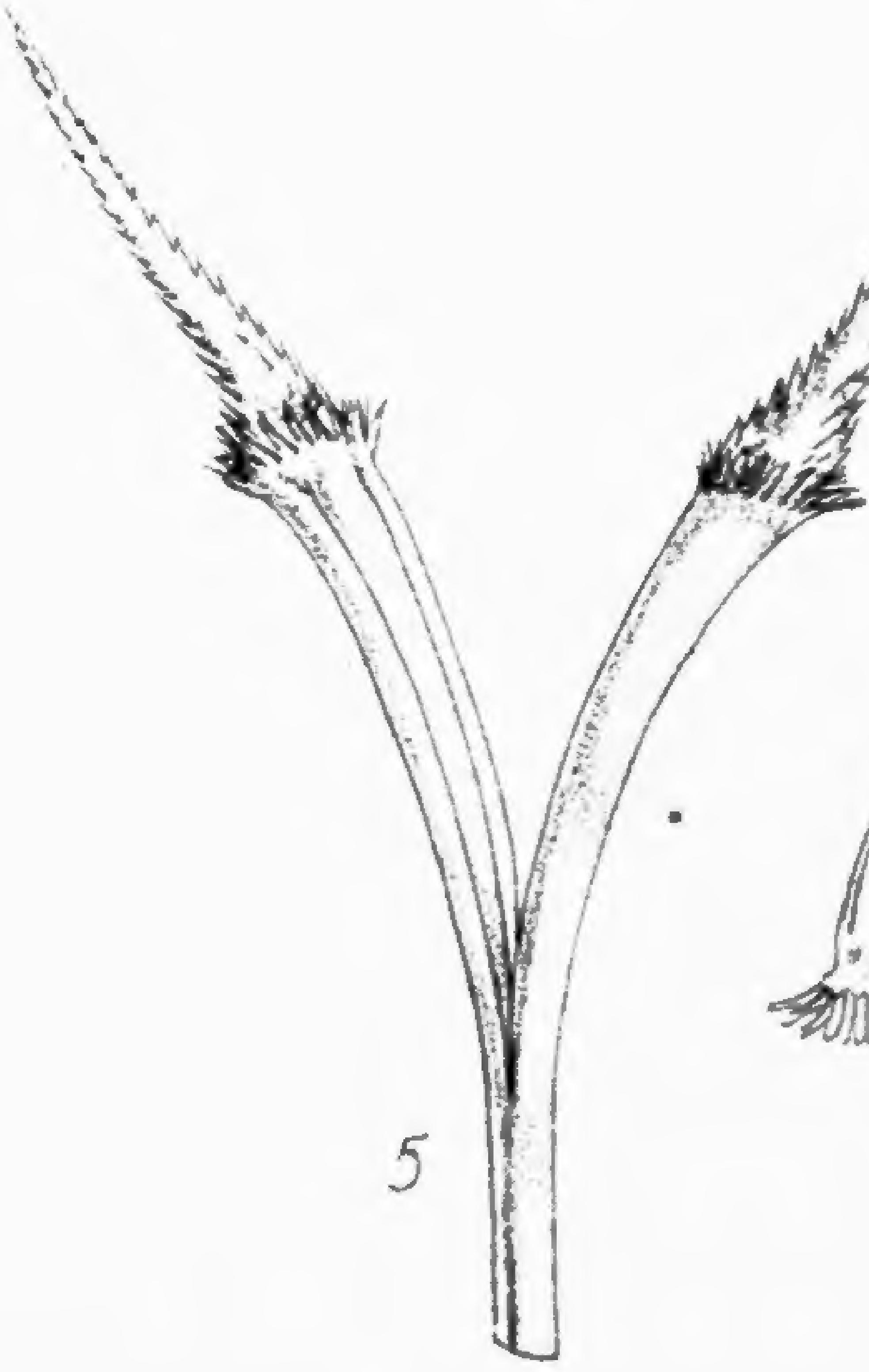

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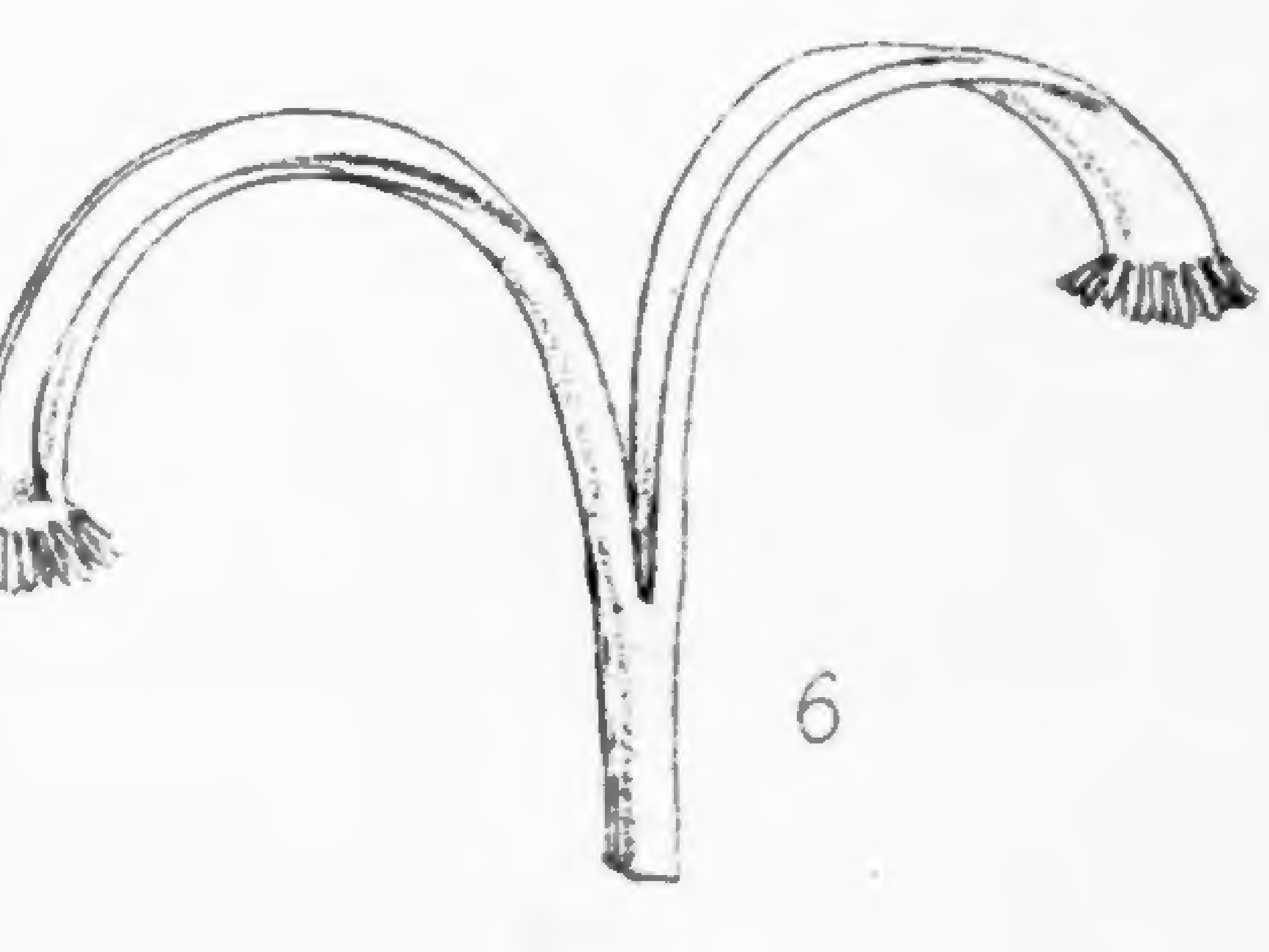

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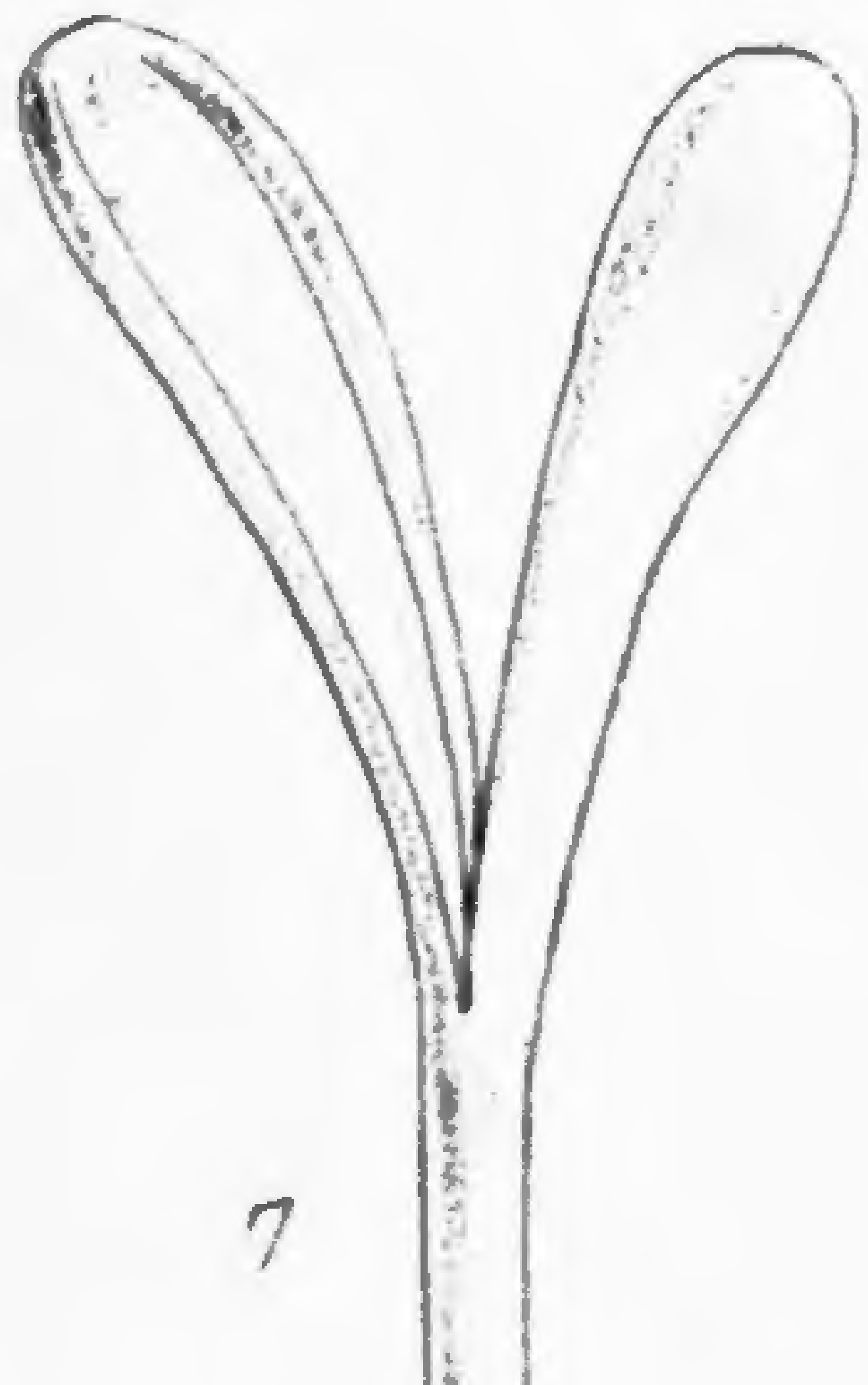

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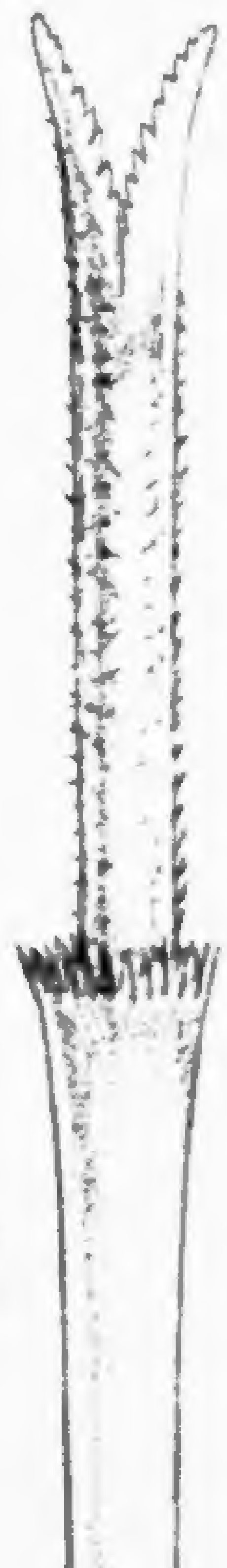

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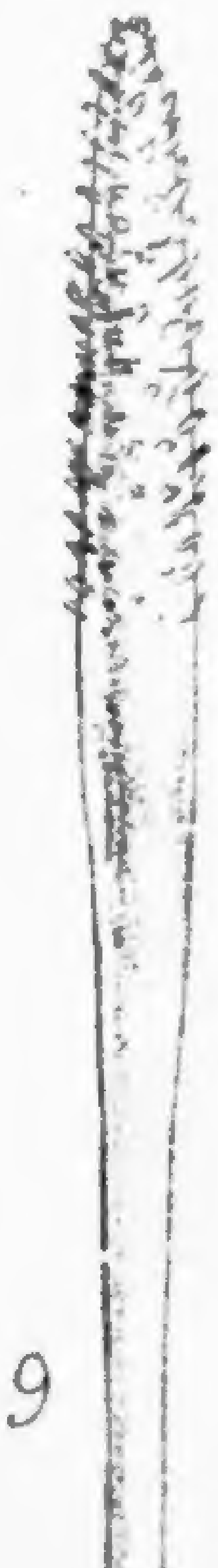

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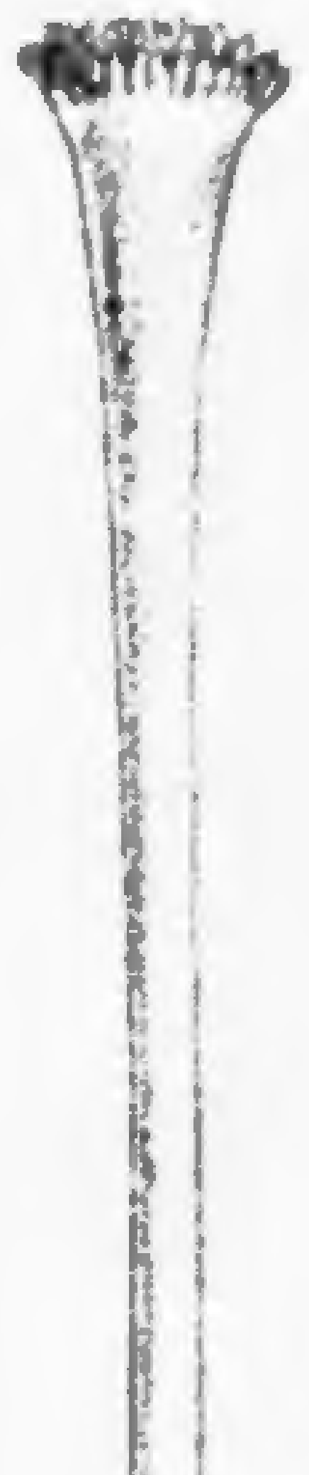

10

W. H. Fitch lith.

J. N. Fitch imp

Calycereae
Lobeliaceae
Vernoniaceae
Cichoriaceae
Eupatoriaceae
Mutisiaceae
Asteroideae
Cynaroideae
Inuloideae
Arctotideae
Helianthoideae
Calendulaceae
Helenioideae
Senecionideae
Anthemideae

W.H.Fitch lith.